VOL. LXXXIV. No. 2148. JANUARY 24, 1919. PRICE FOURPENCE.

[All Rights Reserved.] [Registered at G.P.O. as a Newspaper and Canadian Magazine rate of Postage.]

LONDON: PUBLISHING OFFICE, 4, LUDGATE HILL, E.C.4. SUBSCRIPTION per annum. Postage, inclusive in Great Britain, £1 1s. Canada, £1 2s. 40c. ($5.80); to all other countries, 30s.—NEW YORK: D. VAN NOSTRAND CO., 25, Park Place, New York City. TORONTO, ONT.: WM. DAWSON & SONS, Ltd., Manning Chambers. PARIS: BOYVEAU & CHEVILLET, Librairie, Etrangère, 22, Rue de la Banque.
Telegraphic Address: "Ageekay, Cent., London." A B C Code. Telephone Nos. City 997; Central 4425 (Editorial only).

GENERAL LIBRARY MICH.

LITHOLITE, Ltd.,
55—57, Hackney Grove, London, E. 8.
Phone and Telegrams: Dalston 582, London.
MANUFACTURERS OF
MOULDED INSULATORS,
FIREPROOF AND OTHER GRADES.
ESTABLISHED NEARLY 20 YEARS.

SILUMINITE.
Fireproof—Non-Hygroscopic—High Resistant.
The New low priced British Insulating Material having qualities and characteristics possessed by no other Insulating Material. Used by the Government and leading Railways, and Electrical Firms.
THE SILUMINITE INSULATOR CO., Ltd.,
The Green, Southall, Middlesex.
Phone: Southall 50. See Large Advt. every alternate week.

H. T. **FERGUSON, PAILIN & Co., LIMITED.** A. C.
SWITCHBOARDS.
L. T. *EDWARD ST., Hr. Openshaw,* **MANCHESTER.** *Tel.: 330 Openshaw.* C. D.

INSTRUMENTS, CIRCUIT-BREAKERS,
AUTO-CUT-IN & CUT-OUTS.
THE Record Electrical Co., Ltd.
BROADHEATH, MANCHESTER.
TELEPHONE: 164 ALTRINCHAM.

A.C. MOTORS.
E. BROOK, LTD.,
11, Queen Victoria Street, LONDON, E.C. 4.
49, Basinghall Street, LEEDS.
Empress Works, HUDDERSFIELD.
See Advertisement, Sup. 43.

SWITCHGEAR.
ERNEST F. MOY, LTD.,
Manufacturing Electrical Engineers and Government Contractors.
GREENLAND PLACE, CAMDEN TOWN, LONDON.

NEW DISTRIBUTION BOXES.
THE CANTIE PATENT FUSE WILL CLEAR A "DEAD SHORT."
ALL CONNECTIONS FROM FRONT.
THE CANTIE SWITCH CO., LTD.,
67, MOUNT ST., NOTTINGHAM.

THE SAXONIA
ELECTRICAL WIRE CO., LTD.,
ALWAYS GREENWICH, S.E.
ALL BRITISH
FLEXIBLE CABLES.

CHURTON
SINGLE and POLYPHASE
MOTORS.
T. HARDING CHURTON & CO., LTD.,
Atlas Works, Water Lane, LEEDS.

SKATOSKALO BOILER SCALING TOOLS.
Sole Maker:
FRANK GILMAN,
9, Westfield Road, BIRMINGHAM.
See Advertisement last week, page xxxiii.

"EMPIRE" AUTOMATIC CONTROL
FOR
Shell Presses, Compressors, Machine Tools,
ELECTRIC CONTROL, LIMITED, GLASGOW.

WESTERN-ELECTRIC
COMPANY, LIMITED,
Norfolk House, Victoria Embankment, W.C. 2
Works: NORTH WOOLWICH, LONDON, E.
TELEPHONES & CABLES.
See Advertisement this week, Sup. 8.

CONNOLLY BROS., Ltd.,
for
WIRES AND CABLES.
See Advertisement last week, p. iii.

CHIMNEYS
Built or Repaired. Boiler Settings.
THE CHIMNEY CONSTRUCTION & BOILER SETTING CO., Ltd.,
7, Princes Street, Westminster, S.W.1
Telephone: VICTORIA 6487.
Telegrams: CHIMBOSETA, PARL., LONDON.

— STAMPINGS, —
Tokens, Checks, Blanks, Press Tools, Cutters, Punches, Dies, also Name Plates, Instruction Plates, Meter Dials, Switchboard Labels, Advertising Novelties, Club Badges, Address Plates.
RELIANCE Engraving Co., Ltd., CHISWICK.

JULIUS SAX
HOLOPHANE FITTINGS.
24a. HIGH STREET,
NEW OXFORD STREET.
LONDON, W.C. 1.

V.I.R. CABLES.
See page xv.

Glasgow Office: 68, Gordon St.
OPENSHAW, DYNAMOS **ELECTROMOTORS, Ltd.** MOTORS MANCHESTER.
London Office: 49, Queen Victoria St., E.C. 4.

Makers of— **FULLER,**
WIRES & CABLES,
ACCUMULATORS,
BATTERIES,
CARBONS.
CHADWELL HEATH, ESSEX.

MAVOR & COULSON, Ltd.,
GLASGOW.
MOTORS, DYNAMOS, SWITCHGEAR.

THE BRITISH
ALUMINIUM
COMPANY, LD.,
109, Queen Victoria St.,
LONDON, E.C. 4.
See large Advt. 3/1/19.

THERMIT, LIMITED,
(Proprietors: NOBEL'S EXPLOSIVES CO., LTD., GLASGOW.
875, Commercial Road,
LONDON, E. 14.
'Phone: EAST 4157. *'Grams:* "FULMEN, PHONE LONDON"

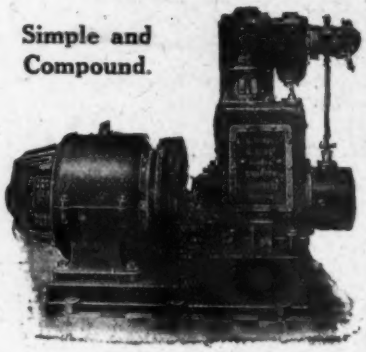
LEA RECORDERS
for measuring
Boiler Feed Water
and Condensed Steam.
The LEA RECORDER CO., Ltd., Deansgate, Manchester

Get "M.E.M."
when "Gear-buying"—to get the simplest safest and most economical system extant
IRONCLAD SWITCHGEAR
Enquire for Catalogue and Folder from
MIDLAND ELECTRIC MFG. Co., Ltd.,
Barford Street - - BIRMINGHAM

Advertisement Index, see page xxxii.

VERTICAL ENCLOSED HIGH SPEED STEAM ENGINES.

Simple and Compound.



For Direct Coupling to Dynamos, Fans, Pumps, &c.

For Ship Lighting and Industrial Works of all kinds.

E. S. HINDLEY & SONS,

11, Queen Victoria Street, E.C. 4.

Works: BOURTON, DORSET. Telephone: City 9804. Telegrams: "Steamport, Cannon."

THE

TUDOR ACCUMULATOR

COMPANY, LIMITED.

NOW ENTIRELY BRITISH

3, Central Buildings,
Westminster, S.W. 1.

TELEPHONE: VICTORIA 816.

TELEGRAMS: "SUBCONICAL, LONDON."

Works: DUKINFIELD, near MANCHESTER.

MICA & MICANITE

INSULATORS FOR EVERY DESCRIPTION OF ELECTRICAL WORK.
Contractors for Air Board, War Office and Admiralty Requirements.
CUTTING AND GAUGING OUR SPECIALITY.
BEST QUALITY MICA ONLY.

'PHONE 4575 CENTRAL.
TELEGRAMS—"MICAYLOR, LONDON."

TAYLOR & CO.,
40, HATTON GARDEN,
LONDON, E.C. 1.
(The Oldest Established Mica House in the country.)

SHAW HIGH PRESSURE STEAM VALVES AND BOILER MOUNTINGS.

TRY "N.K.L." METAL FOR SUPERHEATED STEAM.

J. SHAW, SON & GREENHALGH, LTD., Albert Works, HUDDERSFIELD.

ELECTRICAL INSULATING

TAPES, WEBS, CORDS, SLEEVING &c.

Delivery from Stock.

JOHN MACLENNAN & Co.,

30, NEWGATE STREET, LONDON, E.C. 1.

166, INGRAM STREET, GLASGOW.

V

Vol

The
"Ma
Nati
The
The
Wire
The
Briti
New
Nati
Corr

Busi
The
Note
City
Stoc
Exp
N
Elec
Carb
O
The
m
New
Abst
Cont

T

Ow
of
Inc
sig
cas
ma
to
to
RE

THE

ELECTRICAL REVIEW.

VOL. LXXXIV. JANUARY 24, 1919. No. 2,148.

ELECTRICAL REVIEW.

Vol. LXXXIV.] CONTENTS: January 24, 1919. [No. 2,148.

	Page
The Re-Settlement of Officers	85
"May I Start a New Electrical Business Yet?"	86
National Electricity Supply	87
The Training of Engineer Officers	87
The Future of the Electrical Industry	87
Wireless in the War (*illus.*)	88
The Electrification of Seed, by H. H. Dunn	89
British Electrical Trade in China, by M. Smith	90
New Electrical Openings for British Manufacturers	92
National Electricity Supply	94
Correspondence—	
Electrical Contracting	95
The Shorter Working Week	95
A Protective Association for Non-Technical Officials	95
Engineer Surveyors' Salaries	95
Electrical Engineering in the Army	96
Electricity Supply Progress	96
The "Taylor" System	97
Station Engineers and Representation	97
Business Notes	98
The Electrical Trades Benevolent Institution	104
Notes	104
City Notes	106
Stocks and Shares	106
Exports and Imports of Electrical Goods during October, November and December, 1918	107
Electricity Supply Progress in War Time (*continued*)	107
Carbon Brushes: Considered in Relation to the Design and Operation of Electrical Machinery	108
The Navigational Magnetic Compass Considered as an Instrument of Precision, by M. B. Field (*illus.*) (*continued*)	110
New Patents Applied for, 1918	112
Abstracts of Published Specifications	112
Contractors' Column	Advertisement page xxiv

THE ELECTRICAL REVIEW.

Published every FRIDAY, Price 4d.

The Oldest Weekly Electrical Paper. Established 1872.

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY

OFFICE: 4, LUDGATE HILL, LONDON, E.C. 4.

Telegraphic Address: "AGREKAY, CENT., LONDON." Code, A B C
Telephone Nos.: City 997; Central 4425 (Editorial only).

The "Electrical Review" is the recognised medium of the Electrical Trades, and as by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

Subscription Rates.—Per annum, postage inclusive, in Great Britain, £1 1s. 8d.; Canada, £1 2s. 10d. ($5.80). To all other countries, £1 10s.

FOREIGN AGENTS:

ADELAIDE: Messrs. Atkinson & Co., Gresham Street.
AUCKLAND N.Z.: Gordon & Gotch, Albert Street; Peter G. Tait, P.O. Box 392.
BRISBANE: Gordon & Gotch, Queen St.
CHRISTCHURCH, N.Z.: Gordon and Gotch, Manchester Street.
DUNEDIN, N.Z.: Gordon & Gotch, Princes Street.
JOHANNESBURG, CAPETOWN, BLOEMFONTEIN, DURBAN, PORT ELIZABETH, &c.: Central News Agency, Ltd.
LAUNCESTON: Gordon & Gotch, Cimitiere Street.
MELBOURNE: Peter G. Tait, 90, William Street; Gordon & Gotch, Queen Street.
MILAN: Fratelli Treves.
NEW YORK: D. Van Nostrand, 25, Park Place.
PARIS: Boyveau & Chevillet, 22, Rue de la Banque.
PERTH, W.A.: Gordon & Gotch, William Street.
ROME: Loescher & Co., Corso Umberto 1° 307.
SYDNEY: Peter G. Tait, 273, George Street; Gordon & Gotch, Pitt Street.
TORONTO, ONT.: Wm. Dawson & Sons, Ltd., Manning Chambers; Gordon and Gotch 132, Bay Street.
WELLINGTON, N.Z.: Gordon & Gotch, Cuba Street.

Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, and crossed "London City and Midland Bank, Newgate Street Branch."

TO "ELECTRICAL REVIEW" READERS.

Owing to the continued increase in the circulation of the ELECTRICAL REVIEW in recent months, an increase which has become accelerated since the signing of the Armistice, we cannot guarantee that casual copies will be available. The only way to make sure of securing a copy regularly as issued, is to place a definite order with a newsagent, or else to subscribe direct to the Publisher, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

THE RE-SETTLEMENT OF OFFICERS.

ONE of the biggest problems in connection with the whole subject of demobilisation is: "What shall we do with our officers?" To sing their praises in superlatives is needless to-day—'twere but to paint the lily; the long record of their brilliant and self-sacrificing achievements has already covered them with glory. The question now is not so much what do we *think* of them; nor is it what are we going to *give* them—that is settled up to a point nationally, and they do not ask our sympathy. As in the case of the private, so in the case of the officer—perhaps more so; "he does not want your sympathy—find him a job." Suitable employment and training for employment—these we are under solemn obligations to provide them with. It is stated that there are 400,000 men "of the officer type," and that they represent practically the best brain-power of the nation between the ages of 18 and 45, or thereabouts. It is useless pretending that the signing of the Armistice found us ready with properly developed plans for this or any other part of the work of general demobilisation. We had talked much about what we were going to do, and had put many things down on paper, but, as we have frequently stated, in referring to the aspirations and visions of reconstructors, some little thing may occur at the vital moment to jumble up the whole mosaic. Yet there can be, to our minds, little doubt about it that demobilisation along industrial lines is the sanest, because it is the safest course, and we believe that it will not be difficult to persuade the men to see it so, and to acknowledge that it is in their own interest. We welcome this week the publication of a new pamphlet, No. 12, of the "Reconstruction Problem" series issued by the Ministry of Reconstruction, because it puts forward fully and fairly the whole subject of the re-settlement of Army and R.A.F. officers. We consider it to be the duty of every employer and of every manager to secure a copy, and study the difficulties of the problem at once. We hope also that a copy will be put into the hands of each of the whole 400,000, while those who are interested in the future well-being of any particular officer will be unwise to overlook it. In this vast army of officers, as this pamphlet states, are comprised the whole University and Secondary School class, as well as the pick of the brains outside that class—"men who were selected from their fellows by reason of their intelligence, capabilities, and qualities of leadership." No doubt a very large number of them are "pivotal" men badly needed in business and the professions, but many of them were never in any business or profession at all when they joined the Colours. Perhaps a large percentage of them were at college or school, and the years spent in the Forces are those which would otherwise have been devoted to efforts to launch out upon a career in life. Speaking generally, the man who was singled out for his intelligence, capabilities, and leadership in the Army should be a very

desirable man in civil employment, as calculated to assist the nation in the direction of increased efficiency. Who denies the need for such qualifications in commerce and in industry to-day? We used to have interesting discussions in the old days regarding the suitability of university men for business; well, we ought to have no difficulty in finding them if we want them now. But the problem is not one merely of university or secondary school men. There are others who were in very different circumstances, and were raised from the ranks on natural or acquired merit, which in their humbler civilian circumstances they had been denied the opportunity of developing. They will not return to civil life the lads or men that they were, and in many cases, though they have been deprived of years of business training, experience, or education, they may return to other positions in the same businesses fitted to fill far more responsible duties. For example, even an office boy of wayward ways may speedily develop the aptitude which may fit him for successful service "on the road" after he has got right down to the ways of the business with the older intelligence and the initiative that the Army ways may have encouraged in these years of impressionable mind. We suppose there is hardly a business in the country where this question is not exercising the minds of those in authority. They saw the lad leave them perhaps raw and timid; watched his progress under the influence of the training camp; noted the change in the tone of his correspondence; observed with pride and satisfaction the soldierly bearing, the quickness and the "liveliness" of the "boy"; welcomed him home from the Front with the older atmosphere of a maturer thoughtfulness and seriousness. And now the prospect of the return of the officer of "intelligence, capability, and leadership" to the "place kept open" is before them. It goes without saying that the conditions of industrial, commercial, and professional life have not altered in such a way that a large proportion of the 400,000 men can be absorbed under such circumstances that they will be able to continue the social position that distinguishes the officer from the general run of the men in the ranks—wealthy men and men of position as the latter have often been. Some hardness of lot is inevitable in cases, though it will be softened for a time by the gratuity provision. They will be assisted more satisfactorily from the national point of view, and in their own permanent interest, by the system of training and education that has been established as part of the policy of resettlement. But the early perplexity of some men arises from the doubt concerning the kind of career that they ought to adopt. They have arrived at years when they, in the ordinary course of events, would have practically completed their training. With the utmost goodwill in the world towards such we cannot but endorse the wise words contained in this pamphlet where it says:—"The average young officer . . . will be spared many disappointments if he makes up his mind to the fact that he has to make a new start, no longer as a cog in a vast machine, but as a competing individual." No longer will his pay automatically stand to his account at Cox's; "from the day the physically fit officer puts on civilian clothes he has to fight his own battle for his bread and butter. His earnings will be proportionate to his value as a civil worker." "It is not likely that there will be many 'cooshy' jobs to be stepped into—the competition will be too keen. *Training, education, character—these are the factors that are going to count.*"

It is well that the situation should be put thus frankly. The man who has fearlessly faced the Enemy will not be downhearted as he comes up against this difficulty. He will not have to go alone, for the Ministry of Labour established about a year ago an "Appointments Department" to advise candidates as to the career for which they are best qualified, to provide information regarding methods of training, and to bring employers and those seeking employment together under favourable conditions. This reads very encouragingly, and perhaps when the Department is able to deal with matters along the lines of these aspirations we shall make good progress. It may not, from what we hear, be working very efficiently yet, but it will need to hasten its improvement if it is to contribute that assistance in guiding men to their proper destiny that we all desire it to contribute. Everyone must recognise, however, that no Government Department, whatever its degree of efficiency or its wealth of good intention, can ever achieve great things in so difficult a matter unless there are present two things:—(1) A determination on the part of employers to afford suitable opportunity for men to qualify themselves and a willingness to give the spirit of enterprise free scope in connection with their businesses; (2) a due appreciation by the men of the necessity for making one more gallant effort—namely, to equip themselves for a new career by taking advantage of the facilities provided for their education and training.

"May I Start a New Electrical Business Yet?"

From a number of inquiries that have reached us during the last few weeks, we judge that some of our readers are uncertain whether they are yet free to open new businesses. We are not at all surprised, for it is not easy to keep oneself fully informed regarding the multitude of official notices concerning the withdrawal of restrictions. The Press, which during the period of hostilities suppressed so much interesting information by desire of the Censorship authorities, is not able to devote much space to present-day matters for which the Government desires publicity. The result is that unless the public read many daily papers, or make a regular study of either the *London Gazette* or the *Board of Trade Journal*, they don't know exactly where they are. The withdrawal of restrictions, speaking generally, is most welcome, and most of our readers would be thankful if the pace of their retreat could be accelerated; but steadiness must be assured as far as possible. There are very good grounds why electrical men want to get rid of all restrictions on business development. We are all on the tip-toe of expectation. There is much leeway to make up, and there are new opportunities presenting themselves of which we want to take advantage. The withdrawal of restrictions on the carrying out of new electrical installation work has, naturally enough, induced contractors to get a "move on" with their plans for resuming ordinary business operations. The demand for power for munition works having fallen off, domestic and non-munition industrial work can be considered by the supply authorities; but the many contractors who are with the Forces, and whose businesses have been left in other hands to be kept alive, or have been closed temporarily in their absence, would not like to know that their business interests were to be further jeopardised by new competition because they are not fortunate enough to secure early demobilisation. As our "Business" pages have shown, a number of such men have returned, and probably more will speedily follow as "pivotal" or "one-man business" men; but electrical men of certain types are still required with the Forces for particular duties. Notwithstanding these circumstances—and, of course, these men will have our sympathy, and, we hope, our practical consideration—there should soon be good work for electrical contracting businesses, of both the larger and the smaller descriptions. This opportunity has been recognised by several of our correspondents who want now to "make good," and they therefore ask what they are at liberty to do. The answer to their chief question is that the Retail Business (Licensing) Order of 1918 is still in operation. This Order prohibits the opening of any retail business without a licence issued by, or under the authority of, the Director-General of National Service being obtained. Where there is near at hand a closed or affected business of another electrical man who is with the Forces, there is, we should suppose, little chance of the licence being granted, but where there is virgin soil, possibly the Director-General would give the applicant every consideration, because presumably he is concerned, as everybody else ought to be, in assisting developments which will help the return to normal trading operations, and will provide employment for some of the vast bodies of men whose period of "national service" may be expected to come to an end before very long.

National Electricity Supply.

AT last the report of the Committee formed by the Institution of Electrical Engineers to consider the proposals for the reorganisation of electricity supply has come to our hands, and we reproduce it *in extenso* elsewhere in this issue. We are glad to find that its recommendations are in harmony with the views that we have expressed as to the necessity of the immediate appointment of the Board of Commissioners, and that, unlike the various reports on the Reports of which we have published abstracts during the past few months, it is a thoroughly practical, business-like, and impartial expression of well-considered opinion. The proposal to appoint five Commissioners is approved, but, in accordance with the strong feeling which has been evinced in the country, it is advised that *all* of them be permanent or appointed for long periods, and independent of all other interests, and that the appointments be made sufficiently attractive to secure the very best men in the country. It is urged that general legislation to set the business of electricity supply on a new basis is impracticable, and that the most urgent necessity is to appoint the Commissioners as an advisory board, to guide undertakers in carrying out new developments, and to advise the Government on legislative matters connected with the electrical industry. It is interesting to note that the Committee would grant no administrative powers to the Commissioners, who apparently would take over the duties of the Board of Trade and the Home Office, but would exercise no initiative except through Parliamentary action.

The Training of Engineer Officers.

THE publication of our leading article of last week, on the subject of electrical engineering in the Army, has elicited further information which, while it amply confirms our main contention—"that in future electrotechnology in the broadest sense ought to form an essential part of the training of a Royal Engineer officer"—also indicates that the conditions obtaining on our side of the trenches had a good deal to do with the differences between the methods adopted by our Engineers and by the enemy. For instance, we understand that on the British Front there were few, if any, large generating stations within reasonable distance of the fortified areas, the only large supply undertakings in the western districts being those situated at the Channel Ports; the Huns, on the other hand, were in possession of such industrial towns as Lille, Douai, Laon, &c., and of the coal fields of Northern France and Belgium, which greatly facilitated the development of electricity supply in the occupied districts. Further, the Huns made a point of destroying the French towns on our side of the line, whilst we abstained from shelling the French towns in German hands, out of consideration for the interests of our Allies. Hence it was far easier for the enemy to carry out extensive schemes of electricity supply than for ourselves. But where more favourable conditions prevailed—as at the ports above mentioned—not only did our Engineers make use of the existing plant, but they also carried out extensions on a considerable scale, and developed the use of electric light and power in base hospitals, laundries, bakeries, workshops, &c. While our statements with regard to the use of large numbers of small petrol-electric sets were correct in respect of the active Front, where much of the work had to be done under emergency conditions, better arrangements were made in the more stable areas out of range of enemy operations; as far as possible the small sets were replaced by oil-engines and dynamos of suitable rating, on a semi-permanent basis, and in many cases the local A.C. supply was brought into use, some 200 transformers, aggregating about 7,500 K.V.A., having been supplied for this purpose during the last 18 months of the war. In order to comply with local requirements, a considerable amount of high-pressure underground cable was laid in preference to overhead mains, but the latter were employed freely in the back areas.

Apparently some of the most serious difficulties met with by the Royal Engineer officers in charge of such work—who were professional engineers in civil life before the war—were due to the factor to which we directed attention in our issue of January 10th—the predominance of direct-current practice in this country. Owing to this circumstance, the supply of high-pressure insulators was extremely scanty, and it was equally difficult to obtain electricians acquainted with A.C. work. Transformers of suitable voltages were also not readily obtainable, and our standard types of switchgear, &c., while admirably adapted for permanent home installations, were absurdly out of place under war conditions. As time went on, these difficulties were overcome; and when the Armistice was signed quite a number of schemes were under way which, if they had been completed, would have put a different complexion on the appearance of our electrical practice at the Front.

We made it clear in our first article* that it was not our intention to reflect on the professional ability of our Royal Engineers—our explicit purpose was to point out the defects which had been revealed in the system under which they were trained; as we then pointed out, those defects could be made good by commissioning men who in civil life were engaged in such work, provided that they were given a free hand; and where this was done, excellent results were obtained. But it was naturally difficult for the officers in high quarters, trained under the old system, to appreciate the point of view of the professional electrical engineers, and to realise the importance of adopting modern methods. We are glad to think that this difficulty also has been largely overcome, and but for the sudden cessation of hostilities we should have seen a great improvement in electrical practice at the Front.

The Future of the Electrical Industry.

IT hardly needs arguing to-day that the electrical industry is a "key" industry. Our readers know it; we believe that the official mind that has had to investigate such matters knows; we believe also that even the general public knows a little bit about it, though whether it understands the real importance of the electrical industry to the industrial and common life of the United Kingdom, and to the security of the entire Empire, we are in some doubt—it never has been taught the lesson. The Branch Committee of the New Engineering Industries Committee of the Ministry of Reconstruction is composed of men in direct connection with the electrical industry, and their findings should carry weight with all—the industry itself, the official mind, and the public. But the public must be brought to know somehow what those findings are, and the reasons for them. Their heads are too full of other things just now—so are the columns of the daily papers, and the technical Press they seldom read. We reproduce the report of the Electrical Branch Committee, in full, on another page of this issue. The chief conclusion arrived at is that, in order to secure the full development of the electrical industry, whether in existing or new lines, there must be some measure of Government protection in the home markets against dumped and sweated goods. We commend the complete statement to the careful attention of all our readers. There is no department of British industry for which the prospects are more brilliant than the electrical branch, provided that the safeguards against ruthless attack from outside are adequate. Anti-enemy sentiment will not die at once, but that alone will not suffice. We may, through the Peace Conference, be brought into nodding acquaintance with Germans again when they are committed to paying the full price for all their crimes. Nobody can yet foresee where Bolshevism and Socialism will leave them or the peoples of any other nation; but their efforts to secure their export trade position may be expected to be as enterprising and unscrupulous as in the past. We have got to be prepared against that.

---

* ELECTRICAL REVIEW, May 24th, 1918.

WIRELESS IN THE WAR.

Singular indeed it is to reflect that but for our command of wireless telegraphy, the British Empire, long ere this, would have been rent asunder, and we in these islands would have been writhing, crushed under the heel of the brutal Hun. Yet it is absolutely true. That wireless communication has played an important part in every field of war is, of course, a matter of common knowledge; not only have its functions been important, but also its operations have been

[*French Official.*

Fig. 1.—Wireless Station at Metz.

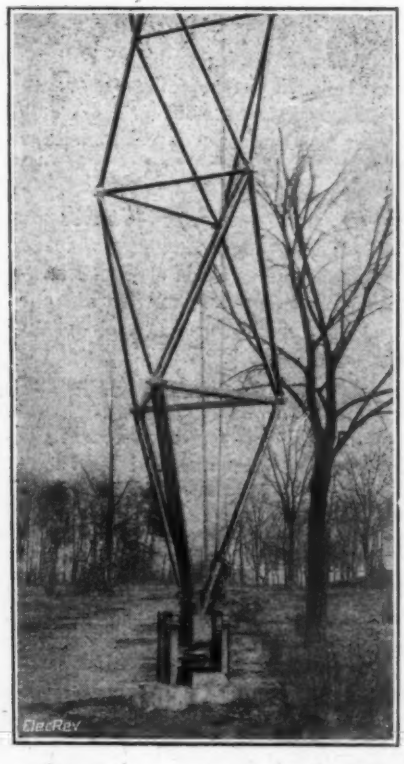
in the highest degree romantic—to it were entrusted on a thousand occasions messages of world-wide interest, of the most tremendous import; by wireless the outbreak of war was proclaimed, the signing of the Armistice was announced; the despair of the heroes of Kut—the surrender of the Turks; the arrogance of the German High Command have been averted, and this country would inevitably have been starved into submission, despite the utmost efforts on the part of our glorious Navy.

To recapitulate the numberless services that have been rendered to the nation by wireless telegraphy—and telephony—during the war would be impossible; it was active and effective over land and water, in the air, and (we are now told) even below the surface of the sea.

Just as the art of aviation has been developed by four years' warfare out of all knowledge, so have astonishing advances been made in the technology of wireless telegraphy and telephony, so that continuous communication can be maintained even with aeroplanes, in spite of the deafening roar which prevents ordinary conversation when aloft, and airmen can actually call up telephone subscribers in their own offices and talk to them.

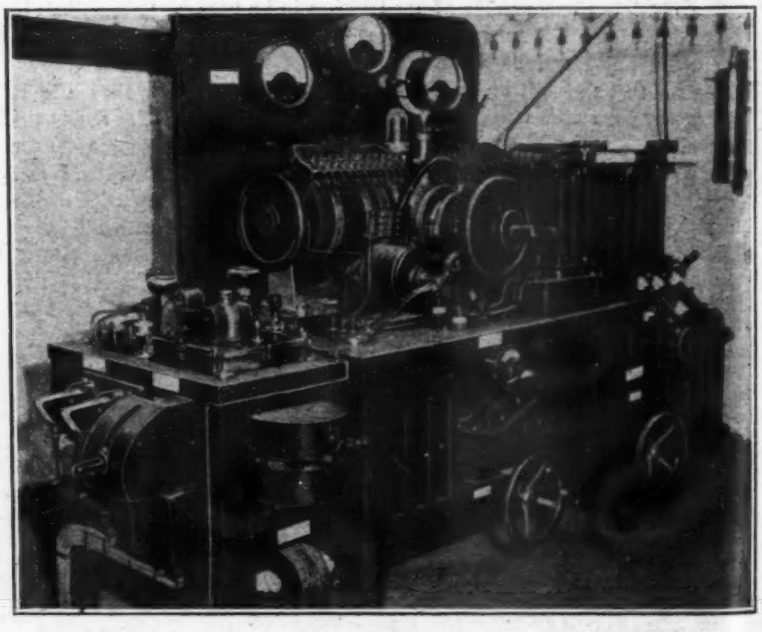
We are all anxious to learn the details of the new methods which have been developed, but no doubt we shall have to wait until the seals have been attached to the Treaty of Peace. In the meantime, let us not forget the debt which we owe to the science, and let us congratulate ourselves that Mr. Marconi, when he arrived in this country as an unknown young man with a mysterious "box of tricks," was not disheartened by the lack of enthusiasm for his proposals with which he was met in official circles, but persisted in the evolution of wireless telegraphy within our borders despite all obstacles until success crowned his efforts, with the result, fortunately for us, that when war broke out this country led the world in the development of wireless communication.

The Germans were not far in the rear; they made the most extensive use of wireless telegraphy throughout the war, and had it not been for "circumstances beyond their control," it would have been of priceless value to them in destroying our commerce; their communication with their colonies was maintained in each case until we were



[*French Official.*

Fig. 2.—Base of Lattice Mast.

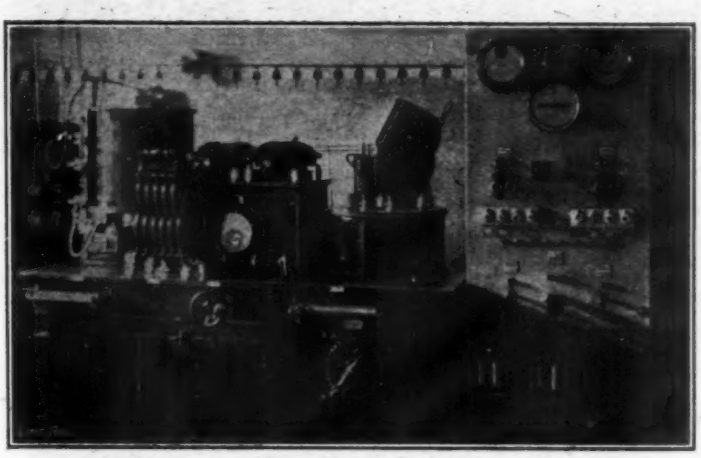


[*French Official.*

Fig. 3.—Poulsen Transmitting Apparatus.

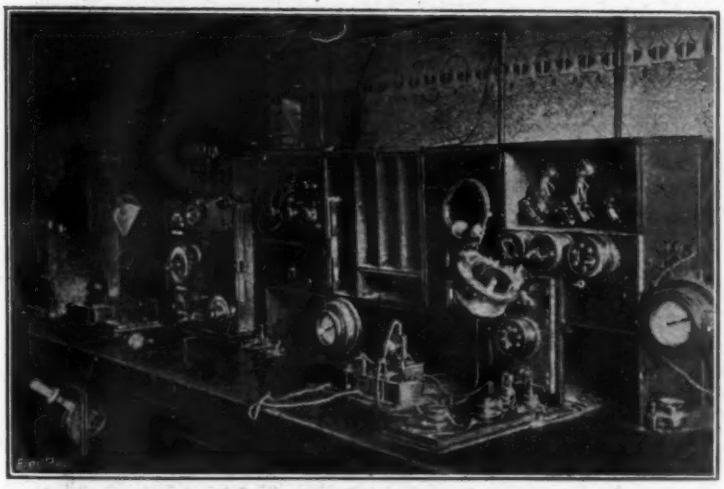
informed the world that the Allied cause was lost—the United States Government declared itself on the side of civilisation and liberty; but, above all, and most important of all, the British Navy maintained communication with its innumerable component elements in every part of the world. And that is why we say that the *rôle* of wireless in the war was of pre-eminent importance to the Allied cause—for without it the submarine menace could not possibly actually able to seize the stations or to compel the staff to destroy them. We are told that a German airship made a trip from Bulgaria to the Cameroons to carry ammunition to the enemy, but on arriving there was warned by the wireless station that the game was up, and returned home without landing—a remarkable achievement. We illustrate herewith a trophy of historic interest—the wireless installation at Metz, which has been reoccupied by our French

Allies, after an alienation of nearly half a century. The station itself is built below ground level, as shown in one of our views (fig. 1); there are two aerials, one supported on a timber mast, the other on the peculiar "Rendahl" mast of steel lattice work, of which the base is illustrated in fig. 2. The wooden mast is 300 ft. high, and tapers from 32 sq. in. at the base to 12 sq. in. at the top; it stands on a concrete block. The steel mast is built up of triangles of steel tubing, making a very light structure, 80 metres high. Other views show the Telefunken and Poulsen transmitting sets, and the receiving apparatus.



[French Official.

Fig. 4.—Telefunken Transmitting Station.



[French Official.

Fig. 5.—Receiving Apparatus.

Underwater Wireless.—A dispatch to the New York *Times* states that Navy Department officials have disclosed how underground and through-water wireless has been put to practical use during the war. This was heretofore a carefully guarded secret. This development resulted from the private research of James H. Rogers, of Hyattsville, Maryland. In practical use the new system has so far been employed only in receiving messages. Radio messages sent from powerful stations in Europe are being read at underground receiving stations in the United States in some cases better than when caught by elaborate and expensive air stations. By the adaptation of the Rogers theory submarines under water can intercept radio signals sent from shore, and with a crude apparatus the scientist succeeded in transmitting signals 2 miles from a submerged wire simulating a submarine. Officials state that it is possible that underground and water transmission can be developed to a considerable extent.—*Pall Mall Gazette.*

THE ELECTRIFICATION OF SEED.

By H. HAMMOND DUNN, F.L.S.

Three years ago my attention was drawn to a series of field experiments which were being conducted on Mrs. Duke's estate at the village of Godmanstone, near Dorchester, with cereals, the seed of which, previously to being sown, had been electrically treated.

I got in touch with the inventor of the process, Mr. Henry E. Fry, who resides in the village of Godmanstone, and found that he had been experimenting with electrified seed, and had come to the conclusion that he had achieved success.

On the eve of the following harvest, I accompanied a few well-known agriculturists on an inspection of crops grown from electrified seed, and the marked difference between the produce of the treated and the untreated fields of oats and wheat convinced us "that there was something in" Mr. Fry's invention, which he had patented under the title of "The Wolfryn Electrochemical Process."

Some five plants for the treatment of electrified-seed corn were installed by the beginning of 1918, the largest being at Poole (Dorset). The seed is treated by being placed in a tank containing liquid chemicals. The tank is connected up to the electric supply, and immediately the seed is placed in the tank the electricity is turned on, and passes through the grain, the process continuing from three-and-a-half to six hours, according to whether the seed corn is barley, wheat, or oats. At the expiration of the period required to treat the seed, the current is switched off, and the grain is conveyed from the tanks to a kiln—up to the present a malt-kiln has been found the best—and is dried at an even temperature. The seed is then sacked up and sent out to the farmer.

Nearly 2,000 acres of electrified-seed corn were harvested in 1918. One farmer grew as much as 300 acres, whilst others ranged downwards to as low as one acre.

So much has been said in the past concerning the application of electricity to farm crops, that it was only to be expected that a considerable amount of interest would be taken in the results of the 1918 harvest of grain grown from electrified seed, and much criticism brought to bear on the process.

At the end of July and the first week in August I had the pleasure of conducting three parties on a tour of inspection of some of the crops grown in Dorset from electrified seed, and they included, amongst others, representatives of the Governments of the United States of America, India, South Australia, Brazil, and Japan, several well-known agriculturists and representatives of the London daily and agricultural Press.

A few days later an investigator—not appointed by the patentees nor by any person interested in the process—came into Dorset, and took measurements of the standing corn, which was cut in his presence, and he afterwards conducted the threshings himself. The results of his investigations were as under:—

Mr. W. W. Lovelace, Piddlehinton, Dorchester, gain on wheat from the produce of electrified corn over untreated, 12 bushels per acre.

Mr. C. Foot, Bincombe, Dorchester, gain on wheat, 6¼ bushels per acre.

Mr. H. J. Cake, Burton, Dorchester, gain on barley, 16 bushels per acre.

Mr. W. W. Lovelace, Piddlehinton, Dorchester, gain on oats, 5¼ bushels per acre.

Mr. H. Legg, Blashenwell, Corfe Castle, gain on oats, 18 bushels per acre.

Messrs. S. & H. Smith, Rollington, Corfe Castle, gain on oats, 19½ bushels per acre.

The investigator, who was connected with one of the well-known agricultural colleges, arrived at these figures after making most careful tests from plots picked out by himself from fields ranging from 2½ to 20 acres. Other results, given by farmers themselves, after threshing, are as under:—

	Bushels per acre.
Mr. S. Hawkins, Whitestone Farm, Exeter, gain on wheat...	8½
Mr. A. T. Cock, Ford Farm, St. Cleer, Cornwall, gain on wheat	12
Mr. W. F. Smith, Godmanstone, Dorchester, gain on wheat...	7½
Mr. A. H. Moore, Leatherhead, Surrey, gain on wheat ...	5½
Mr. R. S. Hicks, Welbraham Temple, Cambridge, gain on oats	5
Mr. B. Godwin, Moreton, Dorset, gain on oats	12
Mr. W. F. Smith, Godmanstone, Dorchester, gain on barley	2

Messrs. Holman & Son, of Totnes, South Devon, also report that two of their customers had gains on barley of 50 per cent. and 21 per cent. from the produce of electrified seed over the untreated. It is not an exaggeration to state that 90 per cent. of electrified seed has produced gains over the untreated produce in the harvest of 1918.

The seed should be sown in the ground within 35 days of treatment.

The visible effect to the eye of electrifying the seed is to blanch it; thus red wheat after treatment becomes pale red, whilst white wheat becomes a purer white.

Another effect of the process on the seed is that the weight per bushel is diminished.

Great care is needed in properly drying the seed after its removal from the tank; if the grain is not properly dried failure is almost certain to result.

In addition to a gain on the produce of the grain there is usually, but not always, a substantial gain in the quantity of straw per acre from electrified seed.

There is usually but little difference to the eye in the appearance of the crops grown from electrified and untreated grain until after the plant has come in ear, and the most marked difference which I have noted is the tillering properties of the plants grown from electrified seed.

At present, the process only applies to wheat, barley, and oats, but Mr. Fry is experimenting with potatoes, maize, rice, tomatoes, and vegetable seeds, and has already achieved much success.

No account of the electrification of seed would be complete which did not bear tribute to the publicity given to it by Dr. Charles Mercier, the famous brain specialist, whose letters in *The Times* and other well-known journals aroused so much interest in the "process" last spring. It was a great pleasure to Mr. Fry and his friends to know that Dr. Mercier was able to visit several farms and inspect the crops grown from electrified seed on the eve of last harvest.

Mr. H. L. Bromby, the engineer to the process, has also accomplished much "spade" work, and it is due to his untiring efforts that some 25 plants for the electrification of seed corn have been, or are being, installed in this country.

Electricity in Agriculture in Italy. — A writer in *Annali d'Ingegneria e d'Architettura* discusses the necessity for the wider application of electricity to agriculture, especially for ploughing, threshing, pressing hay and straw, and for pumping water for irrigation purposes. He describes the construction of an experimental network, comprising 40 km. of high-tension conductor with 20 distributing centres, installed on the Roman Campagna with the collaboration of the Rome municipal electricity works. From the first, threshing and pressing operations were carried out with mobile transformer houses and electric motors mounted on carts, at a cost from 10 to 15 per cent. lower than where steam-power was used. A number of orchard owners have installed motor-driven pumps for irrigation purposes, and with these the cost of irrigating a hectare of ground is from 35 to 50 lire per month, according to the lift of the pump. Owing to the uneven character of the ground in the neighbourhood the author suggests that, to save expense, large tracts of ground should be irrigated from one centre. Experiments made with electric ploughing showed the system to be convenient and practical, provided the work was carried out with method.

BRITISH ELECTRICAL TRADE IN CHINA.

II.—The Difficulties.

By PROF. MIDDLETON SMITH, M.Sc., M.I.Mech.E., Hong-Kong.

It would be absurd to under-rate the peculiar difficulties of the China trade. It is, for example, useless for a firm in Great Britain to send a representative out to China and expect him to send home orders within a month or two of his arrival. A successful local doctor in Hong-Kong came out to the Colony, and was nearly a year resident here before he commenced to practise. He was collecting friendships and making acquaintances. "Friend pidgin," as we call it, goes a very long way in the Far East.

The climate is so very different to that "at home" that it takes some time to get used to it. Once you get over the period of being "a griffin," or a stranger, all goes well. But the conditions of life in China are also different from those in Europe. The ways of the Chinese are said to be "strange and peculiar," and so they seem to the Westerner at first. After a time he understands. The handling of the Chinese, from the man of commerce to the official, or even to the household servant, needs experience. You must pay for it.

The exchange difficulty should not be minimised. Fortunes in business can be, and have been, made, and lost, in exchange transactions. An example was given in a previous article of the fluctuations. But there is a system of "buying gold" ahead. A few weeks ago the writer "fixed exchange" a year ahead for his long leave in England in 1919 at a 3s. 8d. dollar, or say at 5.4 dollars to the pound. When Bulgaria and Turkey went out of the war no local bank would fix it for a month ahead. To-day the dollar is at 3s. 3d. It would be possible for the writer to "sell ahead" and make about from £10 to £12 on every 100 "fixed" without using a penny or a dollar in the transaction, except the profit. But if the dollar had gone to 4s., the laugh would have been the other way. A local business man "fixed exchange" for a year ahead at a 2s. 4d. dollar. When the year had passed and he took up his deal, the dollar was at 3s. 3d. If he had not "fixed," but had waited, he would not have lost 11d. on each 39d. bought. Let us call the loss about 28 per cent. There is, of course, a very distinct amount of chance operating in these matters, and the Chinese gamble on the exchange as all Orientals love to gamble on anything. The shrewd business men cannot always be sure about exchange, but they have experience that the newcomer has to buy—sometimes dearly.

A great difficulty of the British is their excessive dislike to throw a sprat in order to catch a mackerel. That must be done in China. The Chinese like the sprats—by them "they are tickled to death," as the Americans say. Any firm that wants to reap the harvest of trade in China must spend money in sowing and watering the soil. Style means a good deal in China. There are many different ways of advertising, but they all cost money. The Chinese, and for that matter the European "old China hand," dislikes meanness or cheeseparing. The thing must be done well if it is to be done at all. "Nothing succeeds like success" is particularly true of business in China. The most valuable asset of any commercial concern is a general halo of prosperity around its "taipan," of chief manager.

Therefore, the concern ambitious for the China trade must be prepared to spend money in the early years—to throw the sprat. The mackerel swarm in the seas of China trade; the sprat will catch it all right unless the sprat is too skinny, or the line is held by nerveless hands. Not only must the

hands be capable, but they must be experienced concerning China.

Another difficulty is the language problem. There is now a fashion for young men to "come out from home" to firms, and to attend the Chinese language schools of the local chambers of commerce. That is excellent in its way. But observation rather goes to show that by the time a man has mastered the technicalities of engineering work he is not keen on studying what is about the most difficult language on earth. Of course, he ought to do it, and he should be encouraged to do it. Yet it is probably cheaper in the long run to supply a British technical man with a Western educated young Chinese assistant. That is the plan that the writer would put into force if he were exploiting machinery in China. For these young Chinese know their own countrymen as no European of less than about 20 years' residence in China knows them.

Finally, the difficulty with British machinery is that it is all too good. The Chinese do not like a heavy capital expenditure. They find it difficult enough to raise the money—they have great faith in the shares of British companies, but they will not readily co-operate with each other. They do not want brass bearings if cast-iron lined with white metal is good enough. They do not care a button about appearances. So long as the wheels go round and the price is the lowest—that is their purchase. It is futile to talk of educating them above that sort of thing in a year or so. It will take time—but do not let us lose the markets meanwhile. And do not forget that the Chinese like to have plenty of time allowed to them before they pay up.

The Japanese.

A great difficulty facing the British in China today is the competition of the Japanese. It is always best to be quite frank about these matters, and the best friends of any Oriental nation are those who speak out. But it is unfair to hide the good, and throw the searchlight only on to the bad points.

The writer has travelled in Japan, and he came out to the Far East decidedly pro-Japanese. Are not these amazing people our pupils—did not Sir Alfred Ewing, Ayrton, Perry, Robert H. Smith, and other men so well known in our engineering profession introduce the science of engineering into Japan? Do we not rather flatter ourselves as we refer to Japan as the "Britain of the Far East"? Are they not our Allies? Yes—all of those things are true. Japan is, for the tourist, a delightful country. The Japanese are a nation of devoted patriotism and remarkable adaptability to Western progress. They are splendid organisers. But in political and economic matters the Japanese have done some things that need a good deal of explanation.

Let it be bluntly said at once that the Japanese are unpopular in China. The Chinese feel themselves powerless, but they have long memories. The European traders in the treaty ports have many stories about the Japanese, and very few of them are in their favour. Decidedly, the Japanese are unpopular in China.

There are two recent political actions of Japan which must make the Briton pause. When our country was at grips with the biggest menace to its life—when the days were dark and we had not America with us, there swept through Japan a violently anti-British Press campaign. The military party of Japan was in power—no patriotic Briton out here at the time will ever forget that attempt to damage our national prestige, in the Far East, at the most critical moment of our history. It was, as the phrase goes, "not playing the game." If the Japanese Government did not inspire it, some of us think it could have prevented it.

The ambitious island power of the East has acquired more wealth than any other nation because of the war. Fortunes have been made out of munitions and ships. She is our ally; she turned the Germans out of Tsingtao, and she swept the seas to protect her own and our commerce. But in 1915 she made demands on China which astounded the oldest residents out here. An acute American observer, Paul Myton, who has lived in the Far East, wrote of those demands at the time as follows:—

"The programme of Japan in China, as announced from day to day during the last few months, is simply stupendous. The mind is overwhelmed in its consideration. The world has never known anything like it before, and our own petty declarations of the Monroe Doctrine on the Atlantic and the Open-door Policy on the Pacific become mere kindergarten babbling by comparison. For not only does Japan demand of China her most valuable concessions, industrially and commercially, including railways and mining franchises, but she would prohibit China from hereafter ceding such concessions to other countries; thus practically making herself not only the absolute political master of China, but, indeed, the lord trustee of all her domain, and in demanding that the Japanese be employed to the highest rank of the army, of the navy, and of the police, as well as to the highest positions in the Customs and Departments of Finance, they attempt to gain an advantage in the perpetuation of that hitherto unheard-of power which is so tremendous in its possibilities as to bewilder the mind in an attempt to find even a moderate comparison to it in the long history of the world's great conquests."

If the British are Allies of Japan, they are, and always they have been, good friends of China.

The thing which makes the British man of commerce feel so sore in China is the fact that the Japanese trader uses methods which he himself will not use. It is useless enumerating examples. The cotton manufacturers in Lancashire have publicly complained. Imitations of British goods are said to be sold as British in a most unblushing manner, although they have been made in Japan.

The electrical trade of Japan has increased by leaps and bounds during the war. So long as the orders are obtained in open competition, and the goods sold are what they are described as, every one in China wishes Japan "Good luck." There is any amount of room in the enormous potential market of China for the output of Japanese, American, and British factories. All that we ask for is a fair field and no favour. We are, indeed, proud of any good work done by the Japanese. But they must not expect British men of commerce to sit quiet while they exclude them, by so-called diplomatic methods, from the China trade. Their record in Korea and Manchuria before the war may have been of small moment to British statesmen, but it did not please British traders.

Let us "keep our end up" in China, and make a bold bid for the external commerce of the country. We can succeed in fair competition with Japan. We shall only be too pleased to see Japan prosper; we want to be friends with her; we admired her pluck in the war against the Russians, and we have a right to remind her that we "kept the ring" for her while that struggle went on. But there are certain definite Anglo-Saxon ideals in politics and trade, and we will not depart from them to please anyone. All we ask for is open competition and the fair deal. We have paid too dearly in this generation because we wilfully kept blinkers over our eyes. It can do Japan no good in the long run to use trade methods which are utterly at variance with Anglo-Saxon ideals. We have

full confidence that her statesmen and commercial men will realise that—the sanguine think that already they do so. The British want to trade with Japan as with China; co-operation must be the policy of the future in political affairs; and clean, good-humoured competition in the markets of China. As a fact, the latter really means co-operation, for the greater the stimulus the more will be the trade that goes on. Britain opened the oyster of Chinese trade, but there are plenty of pearls for everyone. We most certainly do not want to exclude any legitimate competitors from the markets of the world. The British trader and manufacturer can hold their own against all comers if all comers play the game squarely.

These words are written in no spirit of malice, nor even of hostility, to Japan. They may seem harsh to those who are blinded by the dazzling brilliance of the Rising Sun. They will be agreed to by 90 per cent. of the Britons in the Far East.

The political difficulties of China cause trade difficulties. The Chinese themselves are by no means free from blame, for they have failed to produce a Government which can govern. It may be true that a country gets the government it deserves; but China could be a wonderful market if the system of the Maritime Customs Service were extended to all the Chinese Government Departments.

The British traders in the Far East think that in the past our own British Government has "let us down" badly in China. Even Lord Salisbury made us "lose face" in the late nineties, and to "lose face" in China means complete humiliation. Perhaps the greatest difficulty before the British trader in China can be solved only in Downing Street. It is therefore essential to be alert in London as well as in China if any of the golden eggs laid in China are to be gathered. But, commercially, there are very few geese in China. On the other hand, there is a great deal of gold and other minerals.

Japanese Electrical Goods.

The fact of the matter is that the Japanese electrical goods are not doing the engineering profession very much benefit in China. To put it bluntly, so far as the observation of the writer goes, they are shoddy. They have been selling at high prices, and Japanese wires, lamps, &c., bought in Hong-Kong have been very unsatisfactory. The climate of the China coast finds out any bad spots in cables, instruments, &c. Remember, that for some three months in the year the humidity of the atmosphere is about 90 per cent. Japanese wire had to be used by the writer—he could not get other. But it gave him plenty of trouble.

The Japanese are in danger of overlooking the fundamental principle that in all engineering work time tells the tale. The Chinese buyer is ignorant—he just buys the wire or the lamps because they are cheapest. Some of us are using up our energies in the endeavour to explain that tests are essential. Slowly, but surely, the Chinese of the coast ports is "getting wise" on this point. But the Japanese are going inland and getting orders for complete installations in remote towns and villages. When the plant is in all goes well for a few months. Later on the failures will discourage the Chinese.

The Briton goes to the other extreme. He is too apt to forget that this is a very rough-and-ready country. He does all right in the Treaty ports, where the trained British engineers appreciate his refinements. But don't waste money on paint if the goods go up country. And please see that the goods sent out are ready for use. One British firm sent out plant that had never been "assembled." If it had gone inland it would never have been used. It took modern machinery in Hong-Kong, and also expert European supervision to make the plant "gee."

The following example proves that the Chinese are keen on electric light:—

In 1914 the Hong-Kong Electric Co. sold 614,750 units. In 1916 it sold 5,177,109, and it was compelled to refuse any new connections because its plant was badly overloaded each night. On the one hand, consumers have been indignant because they must not put in a new light anywhere. On the other hand, the local shift engineers have read about life in the trenches with envy. They had a very bad time of it without a scrap of spare plant. The growth of demand by the Chinese was too phenomenal for calculations; it might have been met but for the war. Perhaps in 1920 the figures of 1916 will be doubled.

It is the same everywhere. The Chinese love a blaze of light. A Chinese restaurant uses three or four times as much as one in London; a brilliant light and violent noise is the Chinese aid to digestion!

American competition will help us. Our Anglo-Saxon trade rivals work well with us in China. They do good pioneer work. They show us how to "push" things, but they will forgive an admirer for reminding them that they have not had anything like the experience in trade or in engineering that the Briton has had. But they will be with us in the maintenance of the ideals of our profession. Their technical goods may be less finished than ours, but it does not disgrace the reputation of engineering work. Americans give me the impression that they expect much bigger profits on their capital outlay than do the British. Wherever they go they spread the gospel of the English language and the "get-on-with-it" point of view. They have made up their minds to get into this market, but there is any amount of room for them and for us. It is absurd to suppose that they can drive us out. We may slip off the car because we are asleep, but they will never push us off. It is right to add that, usually, they are more popular with the Chinese because they are rather less of what they call "the higher brow" type than the average Briton. They do not hesitate to mix freely with the Chinese. We suffer just a little in China from the traditions of the Anglo-Indians.

The next article will deal with the rewards open to British engineers and manufacturers in China.

NEW ELECTRICAL OPENINGS FOR BRITISH MANUFACTURERS.

There has been published this week the report of the Engineering Trades (New Industries) Committee appointed by the Ministry of Reconstruction. Pressure upon our space prevents us from dealing this week with the whole of the ground covered. We therefore limit ourselves to the section relating to electrical machinery and apparatus. The Branch Committee responsible for this matter consisted of the following:—

Messrs. J. Taylor, O.B.E. (chairman); H. Taylor (hon. sec.), Mather & Platt, Ltd.; L. B. Atkinson (Cable Makers' Association); A. F. Berry (British Electric Transformer Co., Ltd.); R. Dumas (B.T.H. Co., Ltd.); G. E. Pingree; D. N. Dunlop (B.E.A.M.A.); B. Longbottom (Electromotors, Ltd.); R. H. Schofield (Ferranti, Ltd.); S. D. White (General Electric Co., Ltd.); F. Hird (Siemens Bros & Co., Ltd.).

The report reads as follows:—

The branch Committee was directed to consider a preliminary list of articles furnished by the main committee, which was afterwards modified to the following:—

Adaptors; arc lamp globes; auto horns and buzzars; automobile lighting accessories; bell relays; batteries; brass caps for electric lamps; cables; car lighting sets; car starting sets; carbons; ceiling roses; clocks and clockwork for recorders; counterweights and pulleys; cut-outs (all kinds); distribution boards; dynamos; electric bells, indicators and their accessories; electric cooking and heating apparatus; electrical measuring instruments of the indicating and geographically recording types and parts of the same; electric truck and vehicle motors; electroliers; fittings (small, of all kinds); flash lamps; flexible metallic tubing; fuse boards; fuses; fans—table, ceiling, and propeller; glassware—heat-resisting and non-heat-resisting; hand lamps; holloware for lighting pur-

poses, including reflectors and shades, lanterns and fittings; indicators; induction coils; insulating materials of all kinds; insulators; porcelain and glass; lamp bulbs; lamp holders (all kinds); lightning arresters for large high-voltage overhead transmission lines; magnets, permanent; magnetos; metallic filament lamps; motors; nickel secondary cells; primary cells (various descriptions); porcelain balance weights; portable electric drills, small; portable electric grinders, buffers and polishers, small; power limiting reactance coils; pushes; resistance wire and strip; sparking plugs; static transformers for electrical energy; street fittings; switches (all kinds); switchgear, extra-high-tension. Open-air sub-station equipment suitable for fixing on poles.—Telephone switchboards; apparatus; accessories and kindred appliances, including mining telephones, mining bells, and mine signalling apparatus; vacuum cleaners; wall plugs and sockets (all kinds); watertight fittings; wire (enamel-insulated).

The committee is satisfied, as a result of its investigations, that the majority of the items in this list cannot correctly be described as "either not made in the United Kingdom before the war, but were imported or were made in the United Kingdom in small or insufficeint quantities." As regards most of the items, ample manufacturing facilities undoubtedly exist, and, in many cases, existed before the war, for meeting the whole requirements of the United Kingdom and the Colonies, and, in certain cases, for taking care of the export trade to other countries. These facilities were not, however, fully employed owing to the importation of articles from abroad.

Certain items rightly appeared in the above-mentioned list, and as a result of the activities of the committee, intimations have been received of intention to undertake the manufacture of the following articles: Car lighting sets; car starting sets; electric truck and vehicle motors; fans—table, ceiling, and propellor; motors, small ½-H.P. and less; small portable electric drills; small portable electric grinders, buffers, and polishers. The labour employed in the production of these articles would be chiefly women supervised by skilled men. The concerns who propose undertaking the manufacture of the above articles are already established in the electrical industry, and intend simply to add them to their present lines of manufacture.

Certain items appear in the preliminary list which it appears advisable to treat separately from the general run of items in the list, because they are either not manufactured by the average electrical manufacturing concern, or, if so, are, as a rule, the product of an entirely separate factory; in this category fall: (1) Carbons; (2) insulating materials; (3) magnetos; (4) porcelain for electrical requirements; (5) glassware for arc lamps; (6) sparking plugs. (Items 1, 2, 4, and 5 are not products of engineering industry, but are essential to the manufacture of electrical machines and apparatus.)

(1) *Carbons.*—A special report has been presented by the branch committee, entitled "The Manufacture of Carbons in Great Britain, with special reference to Arc Lamp Carbons," which is printed as an appendix to this report.* In view of the vital importance to the country of this industry, as proved by the position which existed at the outbreak of war, the branch committee strongly recommend that measures be taken by the Government to ensure the continuance of the industry. Certain Government departments and public authorities should reverse their former policy, and in the national interest purchase only British-made carbons.

(2) *Insulating Materials.*—The manufacture of insulating materials can scarcely be considered as falling within the scope of the engineering trades, but ample supplies of satisfactory insulating materials are absolutely essential to the carrying on of the electrical manufacturing industry.

"Insulating materials" includes a very wide variety of products, for example:—

1. (*a*) Ebonite; (*b*) magneto distributor materials; (*c*) composite materials other than the above.

2. (*a*) Cable papers and papers generally; (*b*) leatheroid and fibre.

3. (*a*) Mica and mica products; (*b*) porcelain; (*c*) glass.

4. (*a*) Varnished cloth, silk, and paper; (*b*) adhesive tapes; (*c*) varnishes and compounds; many of which were, to a great extent, if not wholly, imported from abroad prior to the outbreak of war. Considerable progress has been achieved during the war in overcoming the deficiency, but the collective opinion of the industry indicates that: (*a*) An enormous amount of research work is necessary. (*b*) Manufacture in this country cannot be successfully established without State assistance and support. The branch committee finds that many firms are preparing for increased production of insulating materials, and is of the opinion that the development of this industry is absolutely essential to the ultimate success and permanency of the British electrical manufacturing industry. The branch committee recommends that electrical manufacturers should purchase in future only British-made insulating materials where obtainable, and thereby foster this branch of industry.

(3) *Magnetos.*—This subject has already been dealt with in the "Interim Report on certain Essential Industries" (Cd. 9032-1918). Magnetos are now adequately made in this country, and the exclusion of German magnetos is recommended for a period after the war, except under licence, together with the imposition of a duty on all imported magnetos.

(4) *Porcelain for Electrical Requirements.*—This can be divided as follows:—

(*a*) Porcelain for accessories such as ceiling roses, fuses, lampholders, switches, &c.

(*b*) Porcelain insulators for high tension transformers, switchgear, transmission lines, &c.

(*c*) Porcelain for heating and cooking apparatus, sparking plugs, &c.

The branch committee met representative manufacturers of the British porcelain industry, and a resolution was passed unanimously, strongly recommending immediate co-operation between porcelain manufacturers and electrical manufacturers, with the object of promoting standardisation of parts, research, &c. This co-operation has since been established.

(5) *Glassware for Arc Lamps.*—Glassware is an essential part of the arc lamp, and can be divided into two classes: (1) Heat-resisting glass; (2) non-heat-resisting glass; both of which came exclusively from Germany and Austria and were manufactured in moulds and not hand-blown. The method of manufacture of heat-resisting glass was practically unknown in the United Kingdom before the war. During the past three years some progress has been made in this direction, but it is represented to the branch committee that unless Government support is forthcoming glass manufacturers will not be in a position to supply arc lamp glasses in sufficient quantities after the war.

(6) *Sparking Plugs.*—Sparking plugs for internal combustion engines were manufactured in considerable quantities in this country before the war, but the quantity of finished sparking plugs imported was probably greater than the number manufactured here. In the case of the British Colonies, the bulk of the plugs were of foreign manufacture. The manufacture of sparking plugs is a very specialised trade, which, in the opinion of the branch committee, should be encouraged in this country.

Extra-high-Tension Switchgear.—The development of electric power for industrial purposes and for operating railways will, in all probability, cause a demand for extra-high-tension switchgear for working pressures of 25,000 volts and upwards. The fact that such switchgear has not yet been manufactured on a commercial scale in the United Kingdom has led public authorities in the past to place their orders for such gear abroad, usually in Germany or the U.S.A., on grounds that the work must be given to a concern which has "successfully done similar work before." This position seriously affects British export trade, because foreign competitors have been able to bring forward to the detriment of the British manufacturers, not only their greater experience, but the fact that British public authorities were in the habit of placing their orders for such gear abroad. British manufacturers of switchgear should be encouraged, because they have the capacity for such work, which represents merely a step beyond that which they have been doing successfully for years past.

Dependence upon Other Industries.—The electrical industry is dependent upon other industries for certain requirements, amongst which are the following: Refined oil for transformers and switchgear; silicon steel for generators, motors, transformers, &c.; glassware, such as lamp shades and lamp bulbs; flexible metallic tubing for industrial electrical fittings. The war has disclosed a shortage of the above materials, and the branch committee urges the trade associations affected to consider the establishment in this country of the necessary productive capacity.

Effect of Restrictive Legislation.—The electrical industry represents probably the highest development of applied science and mechanical engineering. It originated, broadly speaking, in Great Britain, and should have been nationally fostered and supported, but, on the contrary, its development was hampered by stupid repressive legislation. It was, on the other hand, fostered and supported in other countries, where it consequently progressed rapidly and prospered. To prevent this country from developing the home industry and obtaining its due share of overseas trade, foreign competitors deliberately tried to strangle the industry. Credit should be given to the British manufacturers who under such conditions struggled to maintain their position. It was well known at the time war broke out that the capital employed in the industry was very poorly remunerated, in consequence of which it was difficult to obtain financial support.

Effect of Unrestricted Imports.—The free importation into this country of manufactured goods has always formed a very serious hindrance to the development of the electrical manufacturing industry. Efficient production depends upon specialisation and the scale on which manufacture can be conducted. The insecurity of the home market brought about by the fact that foreign manufactures can at any time be introduced into it for the purpose of deliberately checking or destroying home manufacture by sale at an unreasonably low price, discourages the investment of capital in production on the scale necessary to obtain the highest efficiency, with the result that costs are not lowered as they should be by manufacture on a large scale. The power to withstand foreign competition by keeping selling prices low is thereby lessened, so that the whole system of free importation of manufactured electrical goods, without reference to the conditions under which they may be made has seriously hampered the de-

* The Committee, in their appendix report, point out that had it not been for the action of one firm in continuing to make arc lamp carbons at very considerable loss to themselves, the country would have had considerable difficulty in meeting the demands for searchlight carbons.

velopment of home manufactures, in the absence of which it is difficult to do foreign trade, and to develop to its full extent the trade within the Empire. The free importation of electrical plant and apparatus has made it necessary to share our home market with foreigners, who, operating in their own home markets protected by tariffs and fostered nationally, produce on a far larger scale than the British manufacturer; in face of such conditions the industry cannot be expected to thrive; every effort it may make can be immediately checked by foreign competitors and the home producer has no weapon with which to defend himself.

The branch committee finds from the evidence placed before it that it is essential to establish confidence in the future of the electrical manufacturing industry by assuring it the support of the home market, without which the manufacturers practically all agree that it is hopeless to expect any great development of the industry after the war unless some measure of protection is available. The branch committee accordingly passed the following resolution unanimously: "That war experience and the finding of various industrial committees having proved to demonstration that the electrical industry is a 'key' industry, the recommendations of the Electrical Branch Committee will therefore be based on the assumption that the electrical producers of this country are entitled to receive from the Government protection in the home markets against dumped and sweated goods."

Supply of Electrical Machinery for National Power Stations.—In the event of the Government adopting the recommendations of the Electric Power Supply Committee's Report (Cd. 9062), the branch committee recommends the establishment of a permanent Advisory Council. This Council should be mainly composed of leading British electrical engineers engaged in actual manufacturing, and with a view to keeping the Council always up-to-date there should be compulsory retirement of a certain proportion of the members at reasonably short intervals. The branch committee further recommends that the Advisory Council should be consulted in the first instance with regard to the gentlemen it is proposed to appoint as Electricity Commissioners—who should be technically competent—and should continue as a Standing Advisory Council to the Electricity Commissioners, with a view to ensuring that national development and progress are in conformity with the latest workshop methods of quantity production.

NATIONAL ELECTRICITY SUPPLY.

We have received the following very important statement from the Institution of Electrical Engineers, in the form of a letter, dated January 1st, 1919, and addressed to the Rt. Hon. Sir Albert H. Stanley, P.C., M.P., President of the Board of Trade:—

Electric Power Supply.

1. On June 27th, 1918, the Council of the Institution of Electrical Engineers took into consideration the reports of the Committees appointed by the Board of Trade on Electric Power Supply (Cd. 9,062) and Electrical Trades After the War (Cd. 9,072).

2. These Official Reports embody recommendations leading to drastic revisions of the conditions under which the electrical supply industry had been carried on in Great Britain.

Recognising that the future course of development in electricity supply for industrial and domestic purposes, in electric traction, in electrical manufacturing, and in many other branches of electrical business depended on the character of the legislation based upon these reports, the Council was convinced that the Institution of Electrical Engineers, as the body including and representing those engaged in all sections of the electrical industry, should endeavour to obtain and to collate the opinions of these sections on the fundamental issues involved.

In view of the vital importance of a cheap and abundant supply of electricity to the engineering and other industries, the Council decided to form a special committee, and to include therein representatives of the most important consumers of electric power.

3. Each of the following bodies was invited to nominate two representatives, who, with the President and four Vice-Presidents of the Institution of Electrical Engineers acting *ex-officio*, would constitute the Committee:—

The British Electrical & Allied Manufacturers' Association.
The Association of Consulting Engineers.
The Federation of British Industries.
The Cable Makers' Association.
The Incorporated Association of Electric Power Companies.
The Provincial Electric Supply Committee of the United Kingdom.
The Tramways and Light Railways Association.
The British Electrical Federation, Ltd.
Edmondsons' Electricity Corporation, Ltd.
The Iron and Steel Institute.
The Conference of Directors of the London Electric Supply Companies.
The Electrical Contractors' Association.
The Incorporated Municipal Electrical Association.
The Association of Municipal Corporations.

4. At a preliminary meeting of the Committee, held on July 29th, 1918, it was agreed that each Association represented should give separate and independent consideration to the reports of the two Board of Trade Committees, and should draw up their recommendations as to the main lines which future legislation should follow. The Incorporated Municipal Electrical Association and the Association of Municipal Corporations had, however, decided to submit separate reports to the Board of Trade, and were not represented on the Committee.

5. The reports of the remaining Associations were duly prepared and laid before the Committee, after having been adopted in most cases by the respective Councils of the Associations. They accordingly embody the considered opinions of the accredited representatives of several large groups of electric supply undertakings, the great majority of electrical manufacturers, consulting engineers, and the most important users of electric power for industrial purposes in Great Britain.

6. Some of the reports were less detailed than others, and it is therefore not possible to present a combined opinion upon all the matters dealt with by the two Committees of the Board of Trade. On no point of primary importance, however, is any material difference of opinion displayed. Substantially on the main issues relating to present electrical legislation the various Associations showed an impressive unanimity.

7. The following views and recommendations in regard to electric power supply more particularly are, therefore, presented as expressing the united convictions of the Committee, and through it of the many sections of industry which it represents:—

(*a*) The restrictive conditions embodied in the Electric Lighting Acts, the Tramways Act, the Light Railways Act, and the various Acts relating to electric power supply have had a most detrimental effect on electrical progress in Great Britain. This legislation has led to the multiplication of small arbitrary, and uneconomical areas of electricity supply and systems of electric traction; it has discouraged the investment of capital in electrical undertakings by imposing limited tenure with unattractive terms of expropriation, and various other onerous conditions; it has placed obstacles in the way of grouping undertakings into comprehensive systems of supply and transport; it has, generally, prevented British electrical engineers and manufacturers from realising in their own country the highest achievements of which their technical skill and productive capacity were capable, and it has, in consequence, put them under a serious handicap in the competition for export business against countries in which the conditions have been more favourable for successful commercial demonstration.

(*b*) The evil effect of past legislation, emphasised so strongly by both the official reports, necessitates drastic reform of the enactments referred to, both in the spirit and the letter, if the industry is to fulfil its function of providing cheap and abundant electricity for industrial, agricultural, and domestic purposes, and for the development of electric traction on railways, light railways, and roads.

(*c*) In addition to releasing electrical enterprises from the existing disabilities the chief necessities of the situation are: (1) the treatment of the problem of electrical generation and distribution on broad lines, and (2) the provision of simple forms of procedure in obtaining powers for electrical utilities of all kinds.

(*d*) In order to secure these and other essentials of ordered progress, the proposed appointment of a Board of Electricity Commissioners is welcomed, subject to the provisions expressed below.

(*e*) The Committee is strongly convinced that, owing to the complexity of the technical, administrative, and financial problems involved in a comprehensive scheme of electric supply reform, it will be found altogether impracticable to deal directly with the task of reconstruction by means of general legislation covering all the points at issue. It accordingly urges that immediate action should be confined to the creation of the Board of Electricity Commissioners, which should have powers and functions as outlined in the following paragraphs. There should be a gradual development in the establishing of the administrative machinery as the necessity is felt, otherwise the industry may be hampered in the future by excessive organisation to the same extent as it has been in the past by the conditions which have been referred to.

(*f*) This Board should be a tribunal of skilled men, free from political influence, charged generally with the duties of (1) examining all proposals for the extension and consolidation of existing electrical enterprises; (2) recommending to the Board of Trade and to Parliament, for authorisation, schemes which are on the soundest financial and engineering lines, and (3) advising the Government on legislative matters for the encouragement of the electrical industry.

(*g*) The functions of the Board should be exclusively judicial and advisory. Strenuous objection is urged against the granting to the Board of administrative powers over electrical undertakings, and also of authority to appoint District Boards in the event of such bodies being constituted. In this respect the powers of the Commissioners should be limited to examining schemes brought before them for dealing with the various districts.

(*h*) The preparation of such schemes, whether company, municipal, or joint, should be left as a matter of free and

natural development to the initiative of undertakers who would formulate such schemes (it may be rival schemes), and put them forward for the consideration of the Commissioners, who would report to Parliament upon any Bills intended to carry them into effect. Opponents would be entitled to be heard against such Bills in the usual way.

(*i*) The Board may be empowered to deal with the electrical rules and regulations administered by the Board of Trade and the Home Office, and it may also act as arbitrator and as a court of record for the electrical industry.

(*j*) The Railway and Canal Commission is suggested as a general model for the constitution and powers of the Board.

(*k*) The number of Commissioners on the Board should be five, and in all cases the appointments should be permanent, or for long periods, and should be on such conditions as will attract men of the highest ability, knowledge, and independence. One member should be skilled in legal affairs and in sifting evidence, one in finance, one in the problems of electrical manufacture, and the others with experience in engineering and the management of electrical undertakings.

(*l*) While in the main the work of the Board will consist of formulating the principles of procedure in the course of electrical progress, and of recommending the legislative amendments and the specific schemes which are in agreement with these principles, it may be necessary in some cases for the Board to propose the enforcement, by Parliamentary authority of arrangements for interconnection or amalgamation of supply undertakings.

8. Recommendations have been made by various associations represented on the Committee regarding specific matters dealt with in the reports of the two Board of Trade Committees, but it is felt that these problems will receive a satisfactory solution as a result of the formation of an independent authoritative Board of Electricity Commissioners, which is the crucial matter at this stage.

I am directed respectfully to urge on behalf of the committee that legislation adverse to the views of the large proportion of the industry and of the consumers which the committee represents may not be introduced without its being accorded an opportunity of discussing the matter with you.

I have the honour to be, Sir,
Your obedient servant,
(Signed) P. F. Rowell, Secretary, I.E.E.,
On behalf of the Committee.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Electrical Contracting.

Under this heading a few weeks back, I expressed through your "correspondence" my desire to see established a proper basis for electrical installation work, whereby all contractors or other persons fitting in an installation of electric lighting, &c., would have to adhere to a specification drawn up by some authorised body.

I was pleased to see in your footnote to that letter that the matter was being taken up immediately by the Institution of Electrical Engineers. I am more pleased to see, however, that the matter has been taken in hand by the supply authorities of this district, who, I am informed, are now vested with power from the Government to act in the interests of intending customers, and protect them against rubbishy wiring, &c.

I understand the position has been aggravated by the fact that just recently several large installations which were being put in by the class of individual I mentioned in my previous letter have been condemned, and have had to be stripped out as unsound.

The annoyance to the customers can best be imagined; some might say it served them right for letting out the work in such a careless manner. However, being the representative of a large contracting firm myself, perhaps I had better leave my own opinion unsaid.

The supply authorities inform me that only *bona fide* qualified contractors, who are both in a position as regards experience, and from a financial standpoint, to undertake and carry out an installation which will comply with severe tests, and be in every way satisfactory to them, and absolutely free from the danger of fire, will be allowed by them to commence such work.

I endorse their precautions most strongly, and knowing with them that the whole position of electrical work, speaking generally, is about to be lifted up to a level which it never thought to reach in this country, it is up to someone in authority to see that it does reach that level, and, moreover, remains there for good. A person badly needing electricity on the premises and not in a position financially to pay for a properly installed service should be assisted, to my mind, by the supply authorities, *i.e.*, by the Government. If such assistance is not extended to enterprising persons, and they are debarred from having a cheap job put in by someone out for that class of work, they will possibly turn to some other means of obtaining light and energy.

We want to encourage people to go in for electricity, and prepare them for the time when little else will be obtainable. Under the reconstruction scheme for housing, I believe most of the houses will, as they should, be electrically equipped, as in the States, where the electric sewing machine, mangle, boot cleaning machine, &c., are as common as ditchwater.

The lighting specification for this property should here and now be fixed and standardised by Government, and let out to *bona fide* contractors working under supply authorities' regulations.

H. Y. Fowler.

Messrs. Waring & Gillow, Ltd.,
Electrical Contractors, Liverpool.

[We do not know what powers have been conferred on the Liverpool electric supply authorities by the Government, or under what statutory authority they could be so granted; under the Electric Lighting Acts supply undertakers have no legal control over contractors, though they are authorised to refuse to connect unsuitable installations to their mains. Financial assistance to intending consumers is out of the question.—Eds. Elec. Rev.]

The Shorter Working Week.

In view of the 48-hour week becoming operative for power-station and sub-station shift men in the London District on February 1st, 1919, the method of working adapted by the Manchester electricity undertaking as from January 1st, may interest your readers. A copy of which is enclosed.

Harold H. Morton,
Sec., No. 1 Branch.

London, S.E., *January 19th*, 1919.

Shorter Working Week. Shift Working. Method as adopted by the City of Manchester for Power-Station and Sub-station Employes, on an Average Week of 47 Hours, as from January 1st:—

Day.	1st week.	2nd week.	3rd week.
Tuesday ...	11—7 a.m.	3—11 p.m.	7—3 p.m.
Wednesday ...	11—7 „	3—11 „	7—12 noon.
Thursday ...	11—7 „	3—11 „	Off.
Friday ...	11—7 „	3—11 „	7—3 p.m.
Saturday ...	11—7 „	Off.	7—3 „
Sunday ...	11—7 „	3—11 p.m.	7—3 „
Monday ...	Off.	3—11 „	7—3 „

The above gives two 48-hour weeks and one 45-hour week, or a 47 average over a cycle of three weeks.

A Protective Association for Non-Technical Officials.

I would like to draw attention through your columns to a matter which, to the writer, appears to be one of considerable importance to a large number engaged in the electricity supply industry, *i.e.*, the need for an association on the lines of the E.P.E.A. for those engaged on the "non-technical" side of the industry—chief clerks, accountants, cost clerks, advertising men, &c. An association on the lines indicated to cater for the welfare of this class of employé would appear, in view of foreshadowed developments, a necessity. As it is, we have no organisation to protect our interests. Cannot one be brought into being?

"Non-Technical."

January 17th, 1919.

[An attempt was made a few years ago to form such an association, but without success. Probably the present is a more propitious occasion. We shall be pleased to have the views of other readers on this subject.—Eds. Elec. Rev.]

Engineer Surveyors' Salaries.

Mr. Abraham's letter in last week's Review deserves the thanks of all engineer surveyors employed by insurance companies. As Mr. Abraham remarks, there is no doubt it is a standing disgrace to the insurance companies concerned. The salaries paid are totally inadequate to the knowledge required, and the writer, as an electrical surveyor of 16 years' standing, is now getting the princely salary of £230 and £50 bonus. I am a member of the Engineer Surveyors' Association, which includes both mechanical and electrical surveyors, and my opinion is that if it had not been for the above Association, the insurance companies concerned would not have increased our salaries as much as they have done during the past two years. What is required is that someone like Mr. Wordingham should take up the cause of us poor surveyors. The companies pay 25 to 30 per cent. dividend, so it is not a case of "cannot afford."

Electric.

January 18th, 1919.

Mr. Abraham's letter in your current issue, regarding the salary offered to electrical engineers to act as inspectors for a leading insurance company, will be endorsed by men who know what a man in such a position really ought to understand.

For a man to be competent to judge other people's work it is reasonable to expect him to be something of a past-master in such work; in addition to sound practical experience he should possess a keen sense of perception to get at the points that matter.

In the survey of plant from an insurance point of view, a man with the right qualities would observe points which would not catch the eye of the inspector of the "rules and regulations" type until something happened later which would attract his and everybody else's attention, but which happening would be avoided by the man who really possesses the experience, and can see potential trouble in time to prevent it developing.

High technical knowledge is of little value without years of troublesome experience when it is up to a man to discriminate between a good and a bad job, especially when the latter is of an obscure nature; yet a good technical knowledge is essential, therefore the man for such work as an insurance company's inspector should be one with well-balanced qualities; these being technical knowledge and real practical experience—perception and sound judgment—imagination and logic—determination and tact.

All these qualities are required to enable a man to see weak points in a job or in the case of a breakdown to say what has been the cause, and how it can be repaired without wasting money, or in other words, without making a comparatively small job into a large and costly one at the insurance company's expense; an "inspector" who is buying his experience (also at the insurance company's expense) will not be difficult to bamboozle by a more experienced man, whose object is to get more out of the company than is just; so, after all, the insurance company is not likely to profit by paying such low salaries.

Had the advertisement not stated the salary, but left it for the applicants to state what they required, I think there would have been applications from really qualified men, but not at £150 plus £25 war bonus, even with the vague promise of increase according to merit.

"Practech."

January, 1919.

I am glad to see the question of engineers' salaries was taken up by Mr. A. J. Abraham in last week's issue.

I am a student of electrical engineering, and for the last five years most of my spare time has been utilised for technical advancement. Upon perusing the advertisement columns of weekly engineering journals, and seeing the low salaries offered for various technical posts, I often wonder if I am not working in a "blind alley" direction, and whether my time could be spent in more profitable employment.

I think if engineers in responsible positions would fix a minimum salary for men who can prove that they have recognised technical and workshop qualifications, then some thing would be done to raise the status of their profession.

E. R. Bishop.

Devonport, *January 20th*, 1919.

Electrical Engineering in the Army.

Your leading article in the current issue on "Electrical Engineering in the Army" is extremely interesting to those who have been engaged on electrical work in France. You are quite correct in stating that for the most part power and lighting was supplied by numerous petrol-electric generating sets, but I think the conditions on our side of the line were rather different. It must be borne in mind that the Germans had numerous large towns in their hands which had large power stations. Some of these were in range of our guns, but were not shelled by us, whilst the few stations on our side of the line were destroyed in the early days of the war. I think you will find that at our bases advantage was taken of the French high-tension systems to illuminate our camps and depots, and in a few cases fair-sized power stations were erected where French supply was not available. These stations, however, were equipped with D.C. plant only. One fact remains certain, and that is that advantage was not taken of the services of the large number of electrical engineers in the Army, the great majority of whom were employed on searchlight work only. In the later days of the war, I believe, there was a "petrol economy department" which used to make arrangements to take current from the French power stations, and scrap the petrol-electric sets. Probably the armistice put a stop to the development of this branch of the R.E.'s.

H. Payn.

Exeter, *January 18th*, 1919.

I am very glad to see that you are taking up the question of our shortcomings in the field with regard to the use of electricity, as compared with the Germans.

I am afraid, however, that many people will construe your remarks as a reflection upon the ability and knowledge of the many electrical engineers who served throughout the war with His Majesty's Corps of Royal Engineers. I am sure you do not intend that they should be misunderstood in this way.

The great trouble we were always up against was "tradition" wrapped up in red tape. Tradition in its right place is a splendid thing. It makes men face dangers and stand up to hardships, but as a drag on initiative and an obstacle to advancement, it is certainly *not* in the right place.

In September, 1914, a brother officer and I spent a fair amount of money in carrying out experiments, the results of which would have been very valuable in connection with telegraphy and telephony for military purposes. Having protected the idea—to do which we had to get permission, which was granted—we submitted the idea to the War Office. Somewhere in the early part of 1915 the invention was finally turned down by "The Director of *Artillery*!!" Before the end of the war the idea was discovered in use by the Germans, and we then copied it!!

This is not an isolated instance of the definite discouragement of the technical officer, and after a few such, one gives it up as a bad job, and conforms to regulations very strictly, thus ceasing to be a thorn in the side of one's superiors.

Now! Criticism alone never built anything, but I feel sure that the only solution is to definitely departmentalise the Corps of Royal Engineers, so that we may have specialists instead of Jacks of all trades.

Major, R.E.

London, *January 18th*, 1919.

[We endeavoured to make it clear, both in the article above referred to, and in that of May 24th, 1918, that we did not wish to cast reflections on the Royal Engineers themselves, for whose indomitable courage and professional skill we have repeatedly expressed the greatest admiration; what we aimed at in our criticisms was the *system* which sent those heroes of the old Army into the field without an adequate training in up-to-date electrical engineering. In the former article we said: "It may be thought that the problem can be solved by commissioning as officers men who in civil life are engaged in such work, and this is perfectly true, but only on one condition—that they are invested with full powers to carry out their plans without interference. This, we believe, has not been the case." Our correspondent, "Major, R.E."—with every word of whose letter we wholly agree—emphasises the truth of this statement, while he quite rightly defends the professional electrical engineers who were serving with the R.E.'s against any accusation of inefficiency; we, of course, made no such accusation—as will be seen from the above quotation, we claimed for them freedom from the tyranny of "tradition," to which our correspondent so feelingly refers. Had their services been properly utilised, immense benefits would have been derived from them by the Allied nations in respect of saving of life, economy of expenditure, and an earlier end of the war.—EDS. ELEC. REV.]

Electricity Supply Progress.

The courteous manner in which you dealt with my previous letter emboldens me to crave your indulgence in order to carry the subject a little further.

To my mind, and to be quite candid, your otherwise useful criticism of the Greater London Authorities' report was rather spoiled by just a perceptible tinge of prejudice in favour of company control, and a somewhat contemptuous reference to the efforts of the small local authorities, scarcely justified by the facts.

I did not, of course, claim that either of the two authorities mentioned in my letter were "pioneers," but merely instanced these in support of my contention that small local authorities were just as ready as the companies, to adopt modern methods. I note you question the date of the Halifax installation, but perhaps this is not very material to the point.

There is nothing very surprising in the fact that the Newcastle and District Supply Co. "fostered and developed" Messrs. Parsons's turbines. The company naturally formed a convenient outlet for Messrs. Parsons's activities. Moreover, it was not uncommon for manufacturers to provide machinery for the supply companies, accepting in payment thereof an equivalent value in the supply companies' shares, and this arrangement often enabled supply companies to make progress.

You emphasise your view that "only large undertakings can afford to experiment," but I think it is open to question whether either large or small municipalities are justified in expending any formidable sums of public money for experimental purposes, and even company shareholders have been known to kick against the employment of their money for the purpose of launching untried schemes.

About twenty years ago or thereabouts, very much the same arguments were used in regard to local authorities, and any little township not having a provisional order or which, having obtained one, refrained from putting it into operation, was sure to be branded as "unenterprising" or "lacking in public spirit."

It should also be remembered that in the majority of cases these authorities employed the most expert professional advice available, and surely they should not be too much blamed for being guided accordingly.

The fact that we have been greatly outpaced on the Continent, and particularly in the United States and Canada is, I think, indisputable, but this was not altogether attributable to company control. It was in a great measure due to the freedom with which these companies were allowed to develop, almost according to their own sweet will, whilst at home we have always been handicapped (municipalities and

companies) by sluggish legislative machinery and harassing restrictions placed upon us by Government departments, mostly for the protection of private interests. Under the different conditions it is doubtful whether the U.S.A. companies would have been any more successful than our own authorities.

Further, and writing with some fair experience (not being exactly a "stay-at-home"), I do not believe that overhead transmission, so common in the States, could have been developed in this country to anything like the same extent, nor yet that its adoption would have saved the situation.

One of the greatest stumbling blocks to progress in this country is, I think, traceable to the inherent conservatism of the British factory owner. No tariffs, however ingenious, would induce him to scrap his beam engines, counter shafting, &c. Even the large firms when they did decide to adopt electricity remained in "splendid isolation," and preferred to put down their own comparatively small plants rather than have anything to do with the central supply authority. There are thousands of such plants all over the country, and unless these people can be converted, induced or coerced into taking their requirements from a central source, no national scheme can be altogether successful. Notwithstanding all their difficulties, however, it cannot be denied that many small municipalities have developed their undertakings enormously.

Take, for instance, the Rotherham municipality. Rotherham commenced its supply in May, 1901 (this time I am certain of my dates), in a very modest way indeed, and although commercially successful from its inception, the annual output up to 1914 never exceeded five or six million units, therefore it cannot be regarded as one of the large undertakings. Yet Rotherham has now provided itself with the first super-station in the kingdom, and bids fair to surpass the activities of even the "Great North-East Coast" combination (on whom be peace). The credit for this achievement is surely attributable to municipal enterprise, well directed, and supplemented by capable administration.

The general assumption that small local authorities are anxious to hang on to inefficient and obsolete generating stations will, in my opinion, prove to be entirely erroneous. Accustomed for years to defend themselves against encroachment on the part of their avaricious and more powerful neighbours, these authorities are naturally suspicious as to any infringement of their rights. The circumstances surrounding the appointment of the Board of Trade Committee and the method of investigation subsequently adopted by the committee itself, did not tend to allay these suspicions. On the contrary, antagonism was aroused, not altogether confined to local authorities, which should, and might easily, have been avoided. Given a sound scheme, however, and equitable treatment, the small local authorities will be found as ready to co-operate as either the companies or the larger municipalities.

Let our new Electricity Commissioners be real "live men," unhampered by politics or private interests; give them a free hand to retain what is good, and discard the inefficient, whether such belong to a company or municipality; let them not be too much guided by the reports of the Coal Conservation Sub-Committee or the Committee on Electricity Supply; better still, let them forget that these precious documents were ever issued, and I for one am optimistic enough to believe that an era of phenomenal prosperity for the electrical industry as a whole will be assured.

J. C. Williams,
Engineer and Manager.

Electricity Supply & Tramway Dept.,
Erith, *January 15th*, 1919.

[Mr. Williams has certainly carried the subject further; we are reminded of the gentlemen who was found in possession of a pig some miles from its home, and said it was "only a joke"—the magistrate held that it was "carrying a joke too far." We are tempted to answer his letter in detail, but must restrict ourselves to the following brief comments:

Our admitted prejudice in favour of company control is shared by not a few engineers in municipal employment, besides many such who have transferred their services to companies with advantage to themselves in more ways than one.

We did not suggest that there was anything "surprising" in the fact that the Newcastle and District Co. fostered and developed the Parsons turbine; quite the reverse—it was a particularly apt illustration of what could be done by a company, but could never have been done by a municipality, and the fact that companies can pay for machinery in shares strengthens the argument. In his next paragraph, Mr. Williams emphasises the inherent obstacle to municipal enterprise—the fact that publicly controlled undertakings are not spending their own money; and of course their professional advisers have had to avoid experimentation (though we could readily name instances in which this rule was transgressed, with very unfortunate results to the undertakings).

Mr. Williams agrees that the rapid progress made abroad was due "to the freedom with which these companies were allowed to develop"; we, of course, agree that both municipalities and companies have suffered from legislative and administrative restrictions, but the point which we had in mind was this: that on the Continent and elsewhere abroad companies were allowed to supply over large areas, including towns within those areas, whereas in this country our power companies were excluded from the big towns in their areas by the action of the local authorities, and thus their development was hampered, and is hampered to this day.

The demand for facilities for overhead transmission has been endorsed by the municipal authorities.

The British factory owner is sensitive enough when his pocket is touched; had a cheap supply of power been available at his door, he could not have afforded to ignore it.

The extraordinary development of electricity supply undertakings during the war was due to extraordinary circumstances; the municipal authorities rose to the occasion splendidly—but what progress would they have made if the war had not happened?

Having been granted statutory powers, the small local authorities are justified in maintaining their rights against infringement; but they admit, through their representatives—both engineers and councillors—that the system is all wrong, that electricity supply should not have been confined within municipal boundaries, and inferentially that those statutory powers should never have been granted.

With the last paragraph of Mr. Williams's letter, almost every word of it, we cordially agree.—EDS. ELEC. REV.]

The "Taylor System."

I would like to be allowed to make a few remarks regarding Major Pells's article on "What is meant by Efficiency Methods?"

Major Pells has voiced what has actually been in the minds of thousands of engineers. Where in past years it has been the practice in a good many industries to attempt to fit a man into a job, in some cases wasting their own and their employé's time getting the man used to a class of work he has never before had any experience in, in future it must be the task of every employer, not to find the job for the man, but to get the man for the job.

Many a young pupil or apprentice after serving his time has been forced, against his wish, to seek other fields in search for improvement, often having to remodel all his ideas to suit new conditions, and waste a year or so before he becomes as useful in his new job as he was in his last. I would suggest to any firm that adopted Major Pells's idea of an efficiency engineer, that it would be well advised to make use of its most apt pupils or apprentices for this purpose.

Regarding the electrical trades, now that the wages earned are being placed on a footing equal to that of other industries, the call for increased efficiency and economy will be more urgent than it has ever been before, and it will become necessary for all employers to study the smallest details that lead to efficient working, and thus help reduce the working costs. Employés are kept too much in the dark regarding their respective values to any undertaking. It is seldom that any employé knows how his efforts have added to or reduced the working costs. More light on this subject would keep the efficiency problem fresh in the minds of the workers. How many times has a stoker, switchman, or driver, been able to point out to his station engineer the way to improved methods? Although it is early yet to say that plant efficiency has reached its maximum, for the present it appears to be at a standstill, and while this is so the only path to increased efficiency is for the engineers and men to work together, and for all employés to take an active interest in the work.

Some years ago I worked under Major Pells before he commenced his Army career. Then his idea of combating foreign competition was by Tariff Reform. I am pleased to see that he has so far altered his opinions as to realise that there are other means of attaining this end.

H. Bujama.

London, N.W., *January 14th*, 1919.

Station Engineers and Representation.

Whilst viewing with admiration the "spade work" of the pioneers of the above section of the E.T.U., and extending due credit to their achievements, it is nevertheless generally felt that following the influx of central station men, such powers as the Joint Industrial Committee should have been reconstructed, as the existing constitution is certainly not representative so far as those men are concerned, and it is regrettable to note that efforts from these channels to rectify this important deficiency are strongly opposed by sub-station representatives, who claim to "know all about" central station men and their conditions.

I used to imagine that trade-union members *elected* their delegates, but I have yet to learn why a sub-station engineer is most fitted to negotiate matters concerning station engineers.

Back-pressure.

January, 1919.

German World Trade Schemes.—The *Frankfürter Zeitung* learns that a limited liability company has been formed in Germany, with headquarters at Düsseldorf, for the purpose of reconstructing the world trade relations of industrial undertakings and of re-establishing agencies and warehouses abroad. The firm has been started by the Mannesmann Tube Works, which formerly played a leading part in the tube trade on the world market.—*Board of Trade Journal.*

BUSINESS NOTES.

Our Letters from the Front.—A Major, R.A.O.C., writes :—"Please accept my thanks for your kindness in sending me a copy of your valuable journal, as you have done, during the past 18 months out here. The paper has been extremely welcome, I can assure you, as you can imagine when one has served over three years' continuous service out on this Western Front how "rusty" one must be as regards electrical matters.

It may be imagined by many that we are having a slack time of it ; I can assure you that our particular branch is just as busy as ever, but of course under better conditions, inasmuch as we are free from bombing and shelling.

It is to be hoped that the electrical manufacturers and others allied to the great industry will remember that we shall all be seeking jobs before long ; our experience may not be up to date as regards specialist work, but the experience gained is invaluable, whatever branch one has been connected with.

I am now stationed in one of the Belgian towns which is surrounded by an area teeming with factories and coal mines : in most cases the Hun has taken away the machinery. The business to be done out here when things settle down will be simply enormous, and those manufacturers who have a good stock of apparatus will clear their stock out in a week ; I am speaking of plant, large motors, switchgear, &c.

The Institution of Electrical Engineers might evolve some scheme of "liaison" with the electrical profession over here, so as to assist those who will have to do business at an early date.

There appears to be very little copper wire about here, as the Hun took that, so that copper wire contracts ought to be a good line for someone."

Italian Standards for Electrical Machinery.—An Italian standard for electrical machinery is to supersede German standards in the requirements of Government Departments in Italy. By a decree published in the *Gazetta Ufficiale* of December 12th, all electrical machinery ordered by Italian Government Departments is to conform to the standard regulations (for testing) compiled by the Italian Electrotechnical Association in 1916. Before the war German (A.E.G.) standards were in universal use in Italy. This decree crowns the efforts of the Italian Electrotechnical Association to bring Italian standards into application in Italy. The text of the decree, and a copy of the standard regulations (in Italian) can be consulted at the Department of Overseas Trade (Development and Intelligence), 73, Basinghall Street, E.C. 2.—*Board of Trade Journal.*

Compensation Claim.—In support of a claim by the Phonopore Construction Co., before the War Losses Commission, in respect of the occupation of the firm's factory at Southall, Middlesex, the claimants stated that the War Office took possession of their factory for a period of 17 months, and that this occupation resulted in direct loss and dislocation of business.

Telegraphs and Trade.—The London Chamber of Commerce, through the Council, has forwarded to the Prime Minister, the President of the Board of Trade, and the Postmaster-General, a memorandum urging upon them, among other things, the great importance of the resumption of cheap and rapid means of communication. The complete freedom of cable communication, the unrestricted use of cable codes other than those now authorised, and of registered telegraphic addresses, are necessary in order to rehabilitate the United Kingdom in the markets of the world, to increase production, develop exportation, and so on. While the withdrawal of code restrictions might facilitate the resumption of enemy commerce, it would confer upon our own international trade an immeasurably greater advantage, "and the sooner the withdrawal the greater will be the ratio of that advantage."

Prices Advance.—The Enterprise Manufacturing Co., Ltd., announce an advance of 15 per cent. in their list prices of motors, owing to continual advances in labour and material.

Trading with the Enemy.—A further list of names of bodies and persons abroad with whom trading is prohibited, or whose names have now been removed, is published in the *London Gazette* for January 17th.

Export Restrictions Removed.—*The London Gazette* for January 17th contains a further list of relaxations in export prohibitions.

Tar Oils Order Suspended.—The Ministry of Munitions has suspended the operations of the Tar Oils Control Order, 1918, as from January 15th.

Engineering Advertising.—In order to assist firms in the engineering industry to produce a higher standard of advertisement in the Press, Messrs. S. Davis & Co., of 30 and 31, St. Swithin's Lane, London, E.C., have issued a booklet in which they show, printed on a very high-class art paper, examples of a number of advertisements designed by them for well-known manufacturers. We have long held that the preparation of advertisements for the technical Press has been more or less neglected by some firms. A new-comer or underling, of no experience either of publicity or of engineering, pitchforked into such responsible duties, cannot be a success unless he be one of nature's great prodigies. If firms are not disposed to afford a specialist who will be both efficient in the performance of his work and happy in his relations with the Press, they had better by far enlist the assistance of one of the several firms who are qualified in both of these ways, and are prepared to secure good results. Messrs. Davis will send a copy of this booklet to any reader on application.

American Electrical Export Trade Co.—A Central News dispatch to an evening paper states that the International General Electric Co. has been established in America by charter, with a capital of $20,000,000. The incorporators are identified as the General Electric Co., and it is believed that the new company will engage in foreign trade.

Fire.—A fire occurred at the works of the Siluminite Insulator Co., Ltd., Southall, on the evening of January 16th, causing damage estimated at about £1,000. The machinery was saved, and work is being carried on as usual.

The E.T.U. and 47 Hours.—According to the *Daily Dispatch* (Manchester), an analysis of the voting of the engineering and shipbuilding trade (in which 337,029 voted for and 159,887 against) shows that the Electrical Trade Union voted as follows :—For, 4,665 ; against, 2,295. The Instrument Makers voted : For, 1,528 ; against, 1,102.

47-Hour Week Strike.—In London, 15,000 engineering employés are on strike, among their grievances being the fact that since the working of the 47-hour week was introduced certain shop privileges have been eliminated ; such as the 10 minutes' interval for morning refreshment. A conference of the employers and the employed took place on Monday. Surely this is a point that could, and should, have been foreseen and considered by both sides when the 47-hour week was agreed upon !

A Scientific Management Society?—The suggestion that a society be formed for the study of scientific management, and for propaganda on the subject, has already received a certain amount of support, as a result of recent contributions to these columns. "Increased production" has been a favourite topic in both the technical and daily Press for some time past, and it is felt that some association of those interested would be helpful for the interchange of ideas and the gathering of information on the subject. The field of activity for such a society would probably be a large one, but it is felt that the nucleus of the society, rather than its initiators, should decide what its policy should be. All those interested in this proposal are requested to write to the Electrical Review (marking envelope "S.M.S."), so that notice of an inaugural meeting may be sent to them.

Socials.—The fuse department of Messrs. Ferranti, Ltd., electrical engineers, Hollinwood, held a tea, concert and ball at Failsworth, last week, when presentations were made to the day and night foremen, Mr. John Tillotson receiving a timepiece, and Mr. Hartley Hicks a smoker's cabinet.

The annual dinner of the operative staff of the Royal Arsenal Central Power Station took place at Pinoli's on Saturday last, Mr. G. W. Paine presiding. The toasts and musical programme were much appreciated, and at 10.30 p.m. "Auld Lang Syne" concluded the festivity. Messrs. Rolls, Stroud and Grant acted as Committee.

Bankruptcy Proceedings.—Andrew Matson, late electrical engineer, 69, Ewbank Street, Stockton-on-Tees, late 10, Hardwick Terrace, Stockton-on-Tees.—This debtor applied on Tuesday, last week, at the Court House, Bridge Road, Stockton-on-Tees, for his discharge from bankruptcy. The Official Receiver (Mr. Meredith Hardy) stated that the debtor filed his petition in 1917. His liabilities were £219, and his assets realised £29. A first and final dividend of 1s. 5½d. had since been paid to the creditors. It appeared that the debtor started business as an electrical engineer at 10, Hardwick Terrace, Stockton-on-Tees, about 18 months prior to his failure. When he started he had a capital of £20, borrowed money, which he repaid. At his public examination he admitted that he had never been in a position to pay 20s. in the £ since he commenced business, and that all his liabilities had been incurred with that knowledge. He attributed his failure to having commenced business with borrowed money, illness of his wife, keen competition, and loss on contracts. Mr. C. L. Townsend, for the debtor, said that since his failure he had been working in the mercantile marine, and had accumulated a little money, which would put him in the position of starting with capital. He was prepared to pay an amount which would provide for a further dividend to his creditors, if it could be spread over a short period so as not to interfere with his capital, as he wished to start at once. His Honour Judge McCarthy granted the discharge, conditional upon the payment of £20 within a period of three months.

Chas. Mayfield, electrical engineer, Clifton, Bristol.—Adjudication order made January 15th.

A. F. Hawdon, formerly an electrical engineer, Newcastle-on-Tyne, now a wireman in the Navy.—At Newcastle-upon-Tyne Bankruptcy Court, on January 16th, Judge Greenwell granted an application for discharge. The discharge was suspended for two-and-a-half years.

Iron Prices.—The Minister of Munitions gives notice that the advance of 15s. per ton in the price of bar iron for home sales, which was announced on December 30th, 1918, as coming into force on January 1st, 1919, also applies to prices of rolled edges iron, sheared-iron tube strip and iron plates and sheets for home sales.

Aluminium.—The price at which the Government are prepared to sell their stock of aluminium has been reduced to £150 per ton for 98/99 per cent. ingot, at which price steps have been taken to stabilise the market. Arrangements have been made in regard to these stocks that they shall be disposed of in such a way as to avoid dislocation in the aluminium industry.

Excess Profits Duty.—The report of the Committee on Financial Risks Attached to the Holding of Trading Stocks is now published by the Ministry of Reconstruction. They regard it as most desirable that the position of industry should be specially strengthened when on the threshold of a period in which markets have to be reorganised or created, and in which industrial conditions are in the highest degree uncertain. The most hopeful line of approach to a solution of this problem lies, they think, in a reduction of the present rates of excess profits duty. The present 80 per cent. duty, they consider, encourages extravagance and discourage enterprise, the reward being paltry, while little margin is left for renewals, development, and the capture of new markets, to say nothing of the establishment of reserves against bad times.

The committee recommend two alternative remedies:—

1. A reduction in the excess profits duty from 80 per cent. to 65 per cent. for the accounting period approximating to the year 1918 now in course of assessment, on the understanding that the duty so remitted is retained in the business and not distributed. This reduction might be accompanied by the withdrawal of the first concession in the White Paper, which was largely a result of the raising of the duty to 80 per cent.

2. If this course is impracticable, the committee suggest that part of the duty now to be paid should be treated as a suspensory reserve for a period of five years, the amount so treated to be represented by a special kind of War Loan to be held on joint account by the Government and the taxpayer. The amount of this reserve should be 20 per cent. of the average excess of profits in the last two years of the duty. After five years this reserve should either revert finally to the State or, in certain specified circumstances, become wholly or in part the property of the taxpayer.

The committee recognise that they have been unable to formulate any scheme of relief for those who pay no excess profits duty. They also consider that a business which has denuded itself of its "immanent stock" at the instance of the Government, to meet immediate needs, has a claim for consideration which is best preferred to, and granted by, the department of State to which the assistance was rendered.

Enemy Propaganda in South America.—The *Times* has received from a Buenos Aires correspondent a characteristic example of the unblushing continuation of German propaganda immediately after Germany had lost the war. The following is a translation of a circular issued by German agents in Argentina for a new weekly paper, price about 6d.:

We take the liberty of bringing to your notice our new illustrated weekly journal, *Neue Welt*, which will appear on January 1st. This paper will not serve for the usual novels and other light reading, but will occupy itself *with all questions of present and future interest to Germans in South America.*

The leading questions of the day will be dealt with, and in addition we shall produce the literary pearls of our leading poets and writers, as well as original articles of the highest class. We shall not be influenced by political events in the Old and New World, as we do not wish to divide our ranks by party politics, but instead to strive for one end:—

Protection and furthering of German *Kultur* and German trade in South America.

We shall hope to reach every German circle in South America.

The *Neue Welt* is no party politics organ. No, it *enters the New World in the interests of all German South Americans, whether their origin be Germany, Austria, Switzerland, or Russia.*

We wish to be German in the broadest sense of the word!

We do not wish to destroy, but to construct!

All suggestions in this sense are welcome, and for advertisements and subscriptions please go direct to Publishers, *Neue Welt*.

Restoring Devastated France.—The Paris correspondent of the *Times* says that a congress of French and American civil engineers has been discussing during the last fortnight a series of vast works designed to enlarge certain French ports, repair roads and mines, canalise certain rivers, and generally perfect the national outfit. With regard to the repair of the devastated mines, it is estimated that it will take one year to pump out the water, and machinery of 30,000 H.P. is being set up for that purpose. Even then it will take two years before the mines can be set going, and five before a normal output will be reached. The Rhone is to be made navigable as far as Lyons, and big irrigation works are contemplated. The Rhone will, it is calculated, be able to furnish electric power to the extent of 750,000 H.P. The necessary capital will be sought in France and America, and it is suggested that the State should assume charge of these works, and entrust their execution to Franco-American societies.

The Federation of British Industries has issued No. 2, Vol. II, of its *Bulletin*, one of the articles in which discusses the Lyons Fair, which is to take place early in March, as an opportunity for British firms to come to the help of France in re-establishing her industries.

The Electrical Market in South Africa.—In the course of an article on South Africa's Great Market for Electrical Equipment," the *British and South African Export Gazette* says:—

"That the market in South Africa for machinery, cables, fittings, and other material for electric light and power purposes is one which is well worth looking after may be judged from the fact that for a recent five-year period the average annual value of such imports, exclusive altogether of telephone and telegraph cable and wire, amounted to as much as £1,086,340. It is all the better worth looking after now that Germany is unlikely to be able to compete for many years to come on anything like the old favourable terms of the past. Great as the strides are which have been made in electrical development throughout the Union, Rhodesia, and British and Portuguese East Africa, it is even yet only in its infancy, and when railway electrification is seriously taken in hand in the Union, as it seems certain to be at no very distant date, and the large new industrial equipments already projected are permitted to be undertaken, the plant and material for which an urgent need will have been created must represent very much more in annual value than the gross total of all the electrical imports which South Africa has in the past drawn from other parts of the world. Relatively small as the beginnings which have been made may be rated, however, there are to-day scattered throughout South Africa no fewer than 53 plants, each busily occupied in supplying electricity either for power, lighting, heating, or cooking."

The writer goes on to give a summary of the principal electrical systems serving the mine districts and the larger cities.

The U.S. and Foreign Electrical Trade.—In the course of an editorial, entitled "The Foreign Trade Door Open," the New York *Electrical World* says that it is high time that the American nation made a substantial beginning in learning what it required to know on the subject of foreign trade. The writer remarks that present American foreign trade knowledge rests largely with the companies which have done an international business for many years, notwithstanding unsympathetic laws and law-makers, and they have paid a price for their information. "Certainly the big companies have done much in the past to build a reputation for this country in foreign lands. They have put distributive organisations in the leading countries where sales are possible; they have established connections, men and agents trained in their products and the needs of consumers; their names and output are known favourably. They have faced European competition for years; they are able to market apparatus and supplies where that competition exists. Probably they can continue in much the same way as they have done. But with expanding circles of consumers in other countries it is to be hoped that they will develop the size of their business in proportion. They are entitled to benefit from their pioneer work."

But our contemporary is also interested in the case of the smaller manufacturers. It says:—"With the small companies in the electrical industry the desirability of building export business under the new domestic and world conditions is also clear. They have a large productive capacity; they can meet competition as the large companies meet it; they have their individual problems of keeping labour employed at good wages. Under the old conditions they lacked sufficient points of contact with buyers in foreign countries to make a profitable business easy, if indeed it was practicable at all. They could not afford to finance exploitation of foreign possibilities as readily as companies of greater resources. But now that Congress has opened the way for co-operative organisations in foreign trade through the enactment of the Webb law they can initiate a movement to represent a number of units in the electrical industry."

Iron and Steel Output and Stocks.—The following figures are issued by the Minister of Munitions:—

A. *Stocks of Iron and Steel.*—The total stocks in the hands of the Government available for disposal at the end of December, 1918, were as follows:—

	Government stock at end of December, 1918.
Pig iron (Swedish!)	80,000 tons.
Shell steel billets (suitable for re-rolling)	210,000 tons.
Ships plates (purchased in U.S.A.)	19,800 tons.
Bright steel	5,000 tons.
Bar iron (Swedish)	10,000 tons.

These figures, which include all stocks of U.S.A. steel in this country, only represent stocks in the hands of the Government still to be disposed of, and do not include stocks in the hands of private firms, neither do they include stocks of forgings and semi-finished shell.

B. *Outstanding Commitments from Overseas.*—The bulk of the Government contracts in U.S.A. for iron and steel have been cancelled, and the existing stocks of shell steel at American ports and steel works are being disposed of in the American market. The only outstanding commitments still due to arrive in this country are: (1) 40,000 tons of basic pig-iron from U.S.A., the whole of which has already been allocated to its final destination, (2) 7,500 tons of wire rods from U.S.A. and 2,500 tons from Canada, and (3) 4,000 tons of pig-iron from Sweden.

C. *Output.*—The average weekly output of pig-iron and steel ingots and casting in the United Kingdom during the last six years is as follows:—

	Pig Iron.	Steel (Ingots & Castings).
1912	168,000 tons.	131,000 tons.
1913	200,000 tons.	147,000 tons.
1914	173,000 tons.	151,000 tons.
1915	169,000 tons.	161,000 tons.
1916	174,000 tons.	173,000 tons.
1917	179,000 tons.	187,000 tons.
1918	175,000 tons.	184,000 tons.

Output during the latter half of 1918 was seriously interfered with by the influenza epidemic in July, and the Armistice in November. The average output figures for the first half of the year were 181,000 tons of pig iron and 192,00 tons of steel.

Demobilisation and Employment.—Our readers do not require to be told that the task of reinstating our soldiers and sailors in civil life is a colossal one. Machinery exists for performing it, however, and it is to be hoped that intending employers and employés will avail themselves of it. The Employment Exchanges, assisted by the Local Advisory Committees, which represent equally the interests of both parties in every neighbourhood, are said to have the organisation ready for use. The staffs of the Exchanges have been considerably strengthened in order to meet the extra strain thrown upon them. It is not generally known that branches have been set up to deal with discharged men only, while special sections for disabled men have been established in a great number of cases. As far as possible, the work in these new additions to the Exchange system is carried on by men in the same position as those whom they are helping back to civil employment. Discharged men, with no small proportion of disabled among them, superintend the placing of discharged and disabled men. It has been found that the loss of an arm, of a leg, of two legs, and even of eyesight, is no insurmountable obstacle to the performance of efficient work, given the employers who will employ the men.

The Industrial Reconstruction Council.— The report for 1918 summarises the work accomplished in the setting up of joint bodies on the Whitley principle. The concluding words of the chairman (Mr. E. J. P. Benn) read thus:—

> In entering the New Year the Committee once again appeal for help in carrying on the campaign. We need money, we need personal service, we need the active influence of all who wish to see our great country still greater. One of the most powerful factors towards this end would be united effort in the field of industry. Our safety is menaced by extremists on either side, and it is for the majority who are genuine in their desire for industrial peace to rouse themselves to meet the danger. Let us be as eager for construction as the Bolsheviks are for destruction, and we need have no fear for the security of our civilisation.

Electrical Openings at Palma.—Manufacturers of electrical tramway plant and electric motors suitable for adaptation to sailing ships are invited to send catalogues and prices to the Camara Oficial de Camercio, Industria y Navegacion, Palma, Balearic Isles. The Acting British Consul at Palma states that several important orders have been recently placed by this company.—*Board of Trade Journal.*

Port Elizabeth.—We have received a copy of "The Trade and Commerce of Port Elizabeth," published by the Electricity and Industries Department of the City Council. Mr. B. Sankey, the City Electrical Engineer, is one of the editors of the publication, which sets forth a large amount of information and includes many excellent pictures, which would interest those who want to know anything concerning the general facilities offered by Port Elizabeth from the industrial, residential, electric power, and other points of view.

Catalogues and Lists.—MESSRS. THACKER, BELL, AND CO., LTD., 44/46, Leadenhall Street, London, E.C. 3.—Illustrated descriptive circulars dealing respectively with standard A.C. motors, and D.C. dynamos and motors, also electric stop motion, manufactured by Messrs. James Tate, of Harris Street, Bradford, for whom they are sole agents.

MESSRS. ELECTRICAL COMPONENTS, LTD., 36, Cannon Street, Birmingham.—Illustrated price leaflet of their convertible electric fire stove.

Trade Announcements.—MR. HARRY MOSS has taken new and larger premises at 82, Leeds Road, Bradford, with showroom, &c. All communications should be addressed there.

MR. T. R. TOPPING, electrical engineer, has now resumed business at his former address—Station Road, Wigan.

Owing to the expiration of the lease of their present offices in Manchester, MESSRS. DRAKE & GORHAM, LTD., are removing on January 27th to 29, Piccadilly, Manchester. Telephone No. 3700; telegraphic address, "Accumulator, Manchester," both unchanged.

MR. C. M. SIMPSON, manufacturing electrical engineer and wholesale supplier, having been released from the Army, is reopening immediately at 4, St. Augustine's Place, Tramways Centre, Bristol.

Book Notices.—*The Electrical Contractors' Year Book*, 1918-19. London: The Electrical Contractors' Association (Inc.). Price 2s. 6d.—This, the first issue of the year book, was prepared in April last year, but, owing to printers' delay, was not published until October, and we understand that it is, consequently, incomplete; another issue is in preparation, for publication in July of this year. The copy which we have received for review came to hand recently, and the general secretary, Mr. Leonard G. Tate, has just settled down in the new offices of the Association at 11-13, Southampton Row. The organisation of the electrical contractors of Great Britain embraces, in addition to the E.C.A., the National Electrical Contractors' Trading Association, Ltd. (N.E.C.T.A.) and the National Federated Electrical Association, with a Council and officers common to all three. Mr. H. J. Cash being the president. Lists are given of the *personnel* of the various committees, sectional Boards, and branches of the organisation; lists of members of the respective Associations follow; and an interesting historical sketch of the career of the Association, from its formation in 1901 as the outcome of correspondence in the ELECTRICAL REVIEW, is given. The varied activities of the Association form the subject of a short article, which is followed by an account of the year's work of each of the Associations during 1917. Finally, the working rules adopted at various centres, and the pre-war rates of wages, Committee on Production awards, &c., up to August 10th, 1918, are given. The year book is a welcome addition to electrical literature, and will fill a place which has long been waiting for it on the contractor's bookshelf.

"The Decrease in Ultra-Violet and Total Radiation with Usage of Quartz Mercury Vapour Lamps." By W. W. Coblentz, M. B. Long, and H. Kahler. Washington: Government Printing Office. Price 5 cents.

The Edinburgh Review. No. 467. Vol. CCXXIX. January, 1919. London: Longmans, Green & Co. Price 6s. net.

"Post Office Electrical Engineers' Journal." Vol. II. Part IV. January, 1919. London: H. Alabaster, Gatehouse & Kempe. Price 1s. net.

"Wires and Cables." Pp. 270. Illustrated. Montreal: Eugene F. Phillips Electrical Works, Ltd.

"A Treatise on Gyrostatics and Rotational Motion." By Andrew Gray. Pp. xx + 530; 122 figs. London: Macmillan & Co., Ltd. Price 12s. net.

We have received from Messrs. H. Dunod & E. Pinat, Paris, their list of scientific and industrial books, amongst which are many electrical works. We note that the foreign subscription to *La Technique Moderne*, that excellent review of science applied to industry, which resumed publication a year ago, has been raised to 42 francs to new subscribers.

"*Engineering* Directory." No. 65. October, 1918. London: *Engineering*, Ltd. Gratis.

Calcium Carbide.—The Minister of Munitions announces that on and after February 1st, 1919, the maximum prices for dealings in calcium carbides are amended, and will be as follows for quantities of 110 lb. and over, exclusive of carriage charges, namely—£30 per ton for lump sizes; £30 10s. per ton for granulated sizes up to 15/25 mm.

Dissolutions and Liquidations.—COVENTRY ENGINEERING ACCESSORIES CO., LTD.—This company is winding up voluntarily, with Mr. C. B. Lee, 4, St. Anne's Road, Coventry, electrical engineer, as liquidator.

NATIONAL RESEARCH SYNDICATE, LTD.—Winding up voluntarily. Liquidator, Mr. E. N. Wise, of 6, Cavendish Square, London, W.

ENGINEERING ACCESSORIES CO., LTD.—Meeting of creditors on January 27th, at 18, Hertford Street, Coventry.

ALFRED GRAHAM & CO., electrical engineers, St. Andrew's Works, Crofton Park, and Kilmorie Works, Kilmorie Road, Forest Hill, S.E.—Messrs. A. G. & E. A. Graham have dissolved partnership. Debts will be attended to by Mr. E. A. Graham.

HATCHER BROS. & LARGE, motor and general electrical engineers, Johnson Street, East Ham.—Messrs. T. C. Large, A. M. Hatcher, and H. G. Hatcher have dissolved partnership as from September last. Debts will be attended to by Mr. T. C. Large, who will continue the business.

BRITISH HUHN METALLIC PACKING CO., LTD., London, E.C.—First and final dividend 20s. in the £.

HAFOD OIL AND GREASE CO., oil and grease manufacturers, Earl Street, Swansea.—Messrs. J. Richards and W. H. Reynolds have dissolved partnership. Mr. Reynolds will attend to debts and continue the business.

Radio-active Substances: Order Suspended. — The Minister of Munitions has suspended the Radio-active Substances (Control) Order, 1918.

Raw Asbestos Order Cancelled.—The Admiralty has cancelled the Raw Asbestos Order (including crude and asbestos mine fibres) made January 5th, 1918.

Calendar.—MESSRS. E. P. ALLAM & CO., of 107-109, Gray's Inn Road, W.C. 1, have issued a desk calendar with monthly date cards amidst brilliant surroundings of red and gold.

Catalogues Wanted.—MESSRS. LOWTH & SMITH, electrical and mechanical engineers, 49, Deansgate, Manchester, ask for catalogues of all classes of electrical apparatus.

Copper Prices. — MESSRS. F. SMITH & CO. report Jan. 22nd:—Electrolytic bars, sheets and rods, no alteration.

Messrs. James & Shakespeare report January 23rd:—Copper bars, sheets and rods, £132 per ton.

LIGHTING AND POWER NOTES.

Aberystwyth.—PRICE INCREASE.—The Electricity Co. has informed the T.C. that, from the next reading of the meters, the price of electricity for power will be increased to 3d. per unit net.

Armagh.—PROPOSED E.L.—A meeting of the local Workers' Union has called upon the T.C. to undertake an E.L. scheme.

Aylesbury.—NEW PLANT.—The T.C. has decided to install new plant at the electricity works, at a cost of about £17,000.

Barnsley.—PRICE INCREASE.—The T.C. has decided that, in future, the tariff to bulk supply consumers taking A.C. supply is to be on the following basis:—6s. 6d. per month per K.V.A., plus 0·55d. per unit, based on coal at 15s. per ton, with an increment of ·0025d. per 1d. increase in the price of coal.

Bedford.—YEAR'S WORKING.—The total income of the Corporation electricity department for the year ended March 31st, 1918, was £40,368, and the working expenditure £28,565. Loan redemption amounted to £8,750 and interest to £3,465; £950 was transferred to the reserve fund and £1,060 to the suspense repairs account, leaving a net deficiency of £2,423. During the year, £23,425 was spent on additional buildings, plant, &c.; 6,641,028 units were generated, of which 5,462,838 were sold, including public lighting, 73,000; sewage pumping, 301,986; lighting, 594,782; and power, 4,493,140; 142,323 were used on the works; and 1,035,867 were unaccounted for. The maximum demand was 2,590 KW.

Benfieldside (Durham).—PROPOSED E.L.—The U.D.C. has resolved to arrange for the lighting of its area with electricity, and has voted £700 towards this purpose.

Birmingham.—EXTENSIONS.—Last week the Electricity Committee, accompanied by Mr. C. P. Sparks, who was acting for the Ministry of Munitions, in conjunction with which the Committee is working, visited the new power station in course of erection at Nechells. Nearly £60,000 was spent on the undertaking before the war, but construction was then suspended until a few months ago. The estimated cost of the station, up to an initial capacity of 30,000 KW., is £1,338,710, and sub-station equipment and mains, including a linking-up main to Smethwick, is put at £287,430. The Committee has decided to install two 15,000-KW. turbo-alternators at once.

Bodmin.—PROPOSED E.L.—A meeting, held last week, and presided over by the Mayor, decided to consider the question of an E.L. scheme for the town.

Bradford.—PROPOSED E.L.—The Baildon U.D.C. has inquired with reference to a supply of electricity for lighting from the Corporation.

Calne.—PROV. ORDER.—At its next meeting the T.C. is to consider the question of applying for an E.L. prov. order.

Continental.—HUNGARY.—The Ministry of Trade has prepared a memorandum dealing with the question of supplying the whole country with electric power, which states that the coal supplies of Hungary amount to 1·7 milliard quintals (quintal = 220¼ lb. average); the water power is estimated at 1·7 million H.P., which might be increased to three million, and 72 milliard cb. metres of natural gas and 1,200 million cb. metres of peat are available. In 1913 the consumption of coal amounted to 183·4 million quintals, as against a coal output of 102·7 million quintals; of these 83·9 million quintals were consumed by industry, 58·3 millions for the production of power, and 41·2 million quintals for traffic purposes. Electrification according to modern principles would bring about a great saving, even if the power requirements of industry and traffic were covered by means of energy produced from coal. In the last few years before the war the production of 1 H.P. required 3·7 kg. of coal, and the State Railway trains consumed 0·11 kg. of service coal per kilometre. Should electrification be introduced, one-half of the former amount and one-third of the latter amount would be saved. During the war the output of coal has considerably declined, while the consumption has increased. Even with an increased output, the necessity of import can only be obviated by electrification. To carry out this scheme in its very first stage duplicate plant must be erected—one driven by water producing 180,000 KW. and one by steam producing 150,000 KW. The cost would amount to 840 million kronen, of which 340 millions would have to be covered by the State, especially as the cost of electrifying the railways must be estimated at 170 millions. Steps should be taken to secure the execution of this programme as soon as possible in view of the great coal shortage.—*Pester Lloyd.*

Crayford.—STREET LIGHTING.—The P.C. has arranged with the West Kent Electric Co. for the public lighting of the new estates at Northumberland Heath and Barnes Cray.

Eccles.—INQUIRY.—Owing to the increased working costs at the electricity works, the Electricity Committee has decided to hold an inquiry on the subject.

Edinburgh.—PORTOBELLO STATION.—Subject to the Government's reconstruction scheme, the T.C. has received permission to proceed with the erection of the new power station at Portobello. The scheme provides for three 10,000-KW. generating sets, and the total cost is estimated at nearly £1,000,000. A Sub-Committee has recommended that the work be proceeded with immediately.

Egham.—STREET LIGHTING.—The public lamps on the main road are being converted from gas to electricity, by the E.L. Co.

Gillingham.—NEW PLANT.—The T.C. has secured a loan of £12,668 for the installation of a Diesel engine at the electricity works.

Harpenden.—PROPOSED E.L.—The U.D.C. has appointed a Sub-Committee to meet representatives of the North Metropolitan E.P.S. Co., with reference to an E.L. scheme for the district.

Hove.—NEW SERVICES.—The T.C. has decided that when new services are being installed, the consumer shall pay for so much of the mains as are on private property; previously the Council has borne the cost of services up to 35 ft. from the main.

Ireland.—LOANS.—The L.G.B. for Ireland has informed local authorities that it can now consider applications for loans to carry out urgent public utility schemes.

King's Lynn.—SUPPLY TO SHIPYARD.—The T.C. has agreed to supply electricity to the new shipbuilding yard at West Lynn at the following rates:—Power, 25,000 units and over per annum, 1½d. per unit; 200,000 and over, 1¾d. per unit; lighting, up to 6,000 per annum, 6d. per unit; over 6,000, 5d.; plus 10 per cent. on all charges, and a coal clause.

PROPOSED EXTENSIONS.—The electrical engineer has reported that the present plant will be insufficient in the coming year, and has recommended that tenders be obtained for one 1,000-KW. turbo-generator, with condensing plant, one 400-KW. rotary converter, one Lancashire boiler, and an induced-draught fan.

ELECTRICITY CHARGES.—An application by power consumers for the remission of the last 10 per cent. increase on electricity charges has been rejected by the E.L. Committee. During the war, charges for lighting have increased by 50 per cent., and for power by 95¼ per cent.

Kirkcaldy.—PROPOSED EXTENSIONS.—The borough electrical engineer is preparing plans for the extension of the electricity works.

Lancashire.—WAGES.—An application by the employés of 26 Lancashire and Cheshire municipalities for a further bonus of 10s. per week, in addition to the present bonus of 20s., has been considered by a Court of Arbitration, and an award of 4s. 6d. per week has been made.

Lewis.—PROPOSED E.L.—Lord Leverhulme, who is the proprietor of the Island of Lewis, has acquired the Stornoway Gas Co., and proposes to develop the E.L. prov. order held by the company for the supply of electricity to the town, and for power in connection with canning, guano, and oil factories, which are to be erected on the island.

London.—POPLAR.—The B.C. has approved the selection of Mr. E. M. Lacey to prepare a report on the joint supply of electricity for (1) Poplar and West Ham, and (2) the whole of the N.E. London area. The borough electrical engineer has been directed to prepare a report on extensions of boiler-house plant required for next winter.

STEPNEY.—LOAN SANCTION.—The L.C.C. has sanctioned the borrowing by the B.C. of £12,000 for temporary sub-stations and mains.

E.P.S. COMMITTEE AND LOANS.—In connection with the proposed centralisation of electricity supply, the L.C.C. Finance Committee has agreed to a request of the B. of T. that all applications from local authorities for the extension of generating stations shall be submitted to the Board before sanction is granted, in order that such applications may be considered from the electricity supply point of view, as apart from the financial.

WOOLWICH.—PRICE INCREASE.—The L.C.C. Fire Brigade Committee has sanctioned the payment to the Woolwich B.C. of an increase of 1½d. per unit for electricity for lighting purposes, and ½d. for power.

SHOREDITCH.—The Lighting Committee has recommended that, subject to the consent of the B. of T., the agreement with the Stepney B.C., for the bulk supply of electricity, be extended until March 31st, 1919, unless the turbo-alternator plant at the Whiston Street works be running before that date.

Matlock.—PROPOSED E.L.—The T.C. is considering an electric lighting scheme for its area.

Navan (Co. Meath).—WORKHOUSE LIGHTING.—Mr. Scott, engineer to the B. of G., has been instructed to prepare a specification for increasing the E.L. installation to meet future requirements.

Rhyl.—STREET LIGHTING.—The U.D.C. has decided to replace the arc lamps previously used for street-lighting purposes by 1,000-C.P. half-watt lamps.

Salford.—WAGES.—The T.C. has protested to the Committee on Production against awards of increased wages to Corporation employés being made without previously consulting municipal authorities, and has asked the Committee what contribution it is prepared to make towards relieving the financial strain thus imposed. Alderman Phillips said that in Salford they were paying in war bonuses £236,952 per annum, and people were complaining of the increased fares on the tramways, and the higher gas and electricity charges. The Tramways Committee had to pay £117,928 in bonuses and allowances to dependants, and the Electricity Committee was called upon to find nearly £20,000 per annum.

South Molton (Devon).—WATER POWER.—The T.C. has decided to ascertain from a local firm the terms on which water power can be obtained for the generation of electricity for the town.

Spenborough.—PROPOSED EXTENSIONS.—The engineer to the Council has been instructed to submit a scheme for the laying of electricity mains in Westgate and Cleckheaton, and the supply of electricity for the Scholes district.

Stafford.—Minimum Charges.—The T.C. has decided to reduce the minimum charge for electricity from 7s. 6d. to 5s. per quarter.

Staffordshire.—Breakdown.—Owing to a breakdown on Tuesday, last week, at the electricity works, the supply of power to many factories in the Old Hill, Blackheath, Rowley, and Cradley Heath districts was suspended for several hours.

Swindon. — Proposed Extension. — The T.C. has requested the acting electrical engineer and the tramways manager to report on an application of the Oriental Fibre, Mat, and Matting Co., of Highworthy, for a supply of electricity for power purposes.

Thurles (Munster).—Proposed E.L.—The U.D.C. has decided to consider the question of installing an E.L. scheme within its area.

Wallasey. — Proposed Extensions. — At an L.G.B. inquiry into the work which was necessary to be carried out in the town immediately, the town clerk stated that, although the Corporation had just completed an up-to-date power station, a further £79,432 was required for immediate extensions at the electricity works. The Corporation had been informed that its undertaking would be one which would survive the Government's centralisation scheme.

TRAMWAY AND RAILWAY NOTES.

Belfast.—Working Hours.—The Belfast Branch of the Amalgamated Association of Tramway and Vehicle Workers has instructed its branch officials to take steps to obtain a 44-hour week for vehicle workers, overtime to be paid for at the rate of time and a half, double time for Sundays and holidays, and six days' holiday per year, with pay.

Blackburn.—Strike.—The tramway employés' strike has been settled by the setting-up of a Committee on the lines of the Whitley Report, to deal with matters affecting semi-skilled and unskilled workers.

Blackpool. — Proposed Purchase. — The Fleetwood U.D.C. has threatened to oppose the Corporation's Bill for the acquisition of the Blackpool and Fleetwood Tramroad Co.'s undertaking, as the Corporation will not consent to a joint ownership.

Bradford. — Proposed Extensions. — The Baildon U.D.C. has asked for information as to the commencement of the scheme for a tramway service from the terminus at Baildon Bridge to Baildon village, which has been held in abeyance.

At the T.C. meeting, last week, the chairman of the Tramways Committee said that there were now only 117 cars available, against 248 before the war. Contracts for motors placed in 1915 were not yet fulfilled, and there was little prospect of delivery in the immediate future. There was increased traffic to contend with, and the situation had not been made any easier by the institution of the 47-hour week. It was an utter impossibility for any improvement to take place at present.

L.B. & S.C.R. Electrification.—It is proposed to electrify the line at an early date as far as Sutton and Cheam.

Liverpool.—Working Hours.—The dispute as to the working hours of the employés at the Formby power station, which supplies electricity for the L. & Y. Railway Co.'s electric service between Liverpool, Southport, and Ormskirk, has now been settled. The shift men will receive overtime for all hours above 47 each week. The remaining matter at issue is as to the overtime rate. Under the present arrangement the employés will receive ordinary time rate for overtime; their request is for time and a quarter, and other grades of railway workers are affected by this demand.

London. — Underground Railway Breakdown.—Owing to the overturning of a rail between the Temple and Charing Cross Stations on the District Railway, the whole of the services, with the exception of a few trains going East, were suspended from 5 p.m. till 8 p.m. on Monday. On Tuesday morning, at 10 a.m., inconvenience was again caused by the interruption of the District and Tube Railways, through a mechanical defect at the power house at Lots Road, Chelsea. This delay was of short duration only.

Sunderland. — Electric Vehicle. — The T.C. has sanctioned the purchase by the Tramways Committee of an electrically-driven tower wagon, at a cost of £1,300.

South Africa.—Johannesburg.—The T.C [illegible] rejected the proposal to establish a municipal foundry in connection with the tramway undertaking.

TELEGRAPH AND TELEPHONE NOTES.

Argentina.—H.B.M. Minister, Sir Reginald Tower, conversed on December 10th with the Minister for Foreign Affairs regarding concessions for wireless stations in Argentina; Sir Reginald is reported as having said that British firms had the intention of erecting powerful stations to enable wireless communication to be effected between Great Britain and the countries of South America. A report was circulated in December last to the effect that the German firm of Siemens-Schuckert proposed to erect and work a high-power station in Argentina.

France.—Rapid communication with America was of supreme importance to General Pershing at the Front, and it was owing to his urgent representations that the "Lafayette" station at Bordeaux, described as the largest and most powerful wireless station in the world, was erected by the U.S. Navy. The power of the station is said to be 1,200 kw., and it provides absolutely reliable communication at any period of the year.

Floating mines have caused many breakages of Channel cables recently, and two out of six cables, specially laid for the transmission of Peace Conference messages, are interrupted.

Pacific Cable Traffic.—During the year ending March 31st, 1918, the Pacific Cable Board handled over 7,500,000 paying words of international traffic, nearly 600,000 words of messages (sent free) in relation to wounded members of the Expeditionary Force, and over 1,720,000 paying words between New Zealand, Australia, and the Pacific Islands.

Sweden.—All attempts at mediation have failed in the strike of telegraph and telephone workers, which threatens to affect the entire south of Sweden. It is expected that the majority of the lines of the Stockholm General Telephone Co. will soon cease working.—*The Times.*

Trans-Atlantic Cables.—One of the minor, but extremely important, side issues of the Peace Conference concerns the elimination of every element of German control over the Atlantic cable systems. Before the war, Germany possessed two cables between Rockaway (Long Island), just outside New York, and Emden. In August, 1914, exactly four hours after the declaration of war, a British cruiser cut both cables at a point near Fayal, in the Azores. The cables became prizes of war, and one of them was appropriated by the British, who, two years later, reorganised it to connect between Halifax (Nova Scotia) and the British Isles. The other cable was allotted to France, who up to now has made no attempt to utilise it. The question now arises whether England and France will retain the two cables permanently. France possesses only two direct cables, and no public wireless service to America. A large proportion of her communications have been sent *viâ* British cables and by wireless through London.—*Morning Post.*

United States.—By a unanimous vote the House Committee on Merchant Marine and Fisheries rejected the proposal of the Navy Department that the Government should assume ownership of radio-telegraphy.—*The Times.*

With further reference to the new multiplex system of telephony and telegraphy, invented and developed by the technical staff of the Bell system, the *T. and T. Age* explains that physically it can be employed on any open wire telephone line, but practically it is not advantageous to use it on any short line—say, less than 100 miles in length. The highly technical equipment required is so costly that it is economically available only for long lines. One installation is in service on the Baltimore-Pittsburg line distributing messages to their destinations which are received from Washington over the ordinary circuits. A great amount of new apparatus must be installed, and considerable work must be done on the lines themselves to adapt them to the new system.

The new system sends five voice currents simultaneously over one telephone circuit, taking each wave as it is delivered into an ordinary telephone and delivering it at its destination, another ordinary telephone, exactly as it was formed at the sending point. These five voice currents travel together and are sorted for delivery at their destination. Not a tone or inflection of the speaking voice is changed in passage. This result is achieved by combining each voice wave with a carrier current which has characteristics in degrees of frequency that are entirely different from those of other carrier currents. The carrier current thus gives the voice wave an identity of its own, and at the end of the journey the waves are sorted and directed into their proper channels, to be delivered as formed originally. The advantages of the system, when applied to telegraphy as well as to telephony, were clearly shown in tests. Using the multiplex system with the ordinary hand-operated telegraph instrument, connected with a telephone circuit, from 1,500 to 1,600 words can be sent in a minute. When the multiplex system is connected with the printing telegraph, from 4,000 to 5,000 words can be sent in 60 seconds.

The Commercial and Commercial Pacific Cable Companies have filed appeals in the Supreme Court against the decision of the Federal Court, which, on January 10th, dismissed the suit which they brought to restrain the U.S. Postmaster-General from taking over their cables.

An official United States Bulletin states that the Censorship Board instructions heretofore issued that all confirmations of cablegrams shall be in plain language have been revoked, and the original freedom of action of cable users in this regard is restored. Accordingly, postal packets addressed to the United States which contain the original text of code cablegrams are no longer stopped by the British Censorship.

Uruguay.—Some interesting details regarding the part that wireless telegraphy played in the war in this quarter of the globe were given by Mr. A. Mitchell Innes, H.B.M. Minister at Montevideo. According to the *Montevideo Times*, he said that "the use of the port of Montevideo for provisioning, repairing, and coaling British cruisers had been of great service. Then there was the wireless station at Cerrito. No other American country had permitted the use of its wireless stations for cipher messages. The Cerrito station was the sole medium of wireless communication between the Admiralty, the naval base at the Falklands, and the South Atlantic Fleet. Hence the importance attached to it by the Admiralty—and the efforts of the German Legation to prevent its use." The Minister entered into interesting details showing the important part this privilege had played in the battle of the Falklands—always "within the strictest rules of benevolent neutrality."

Wireless Telephony.—A Washington Press message states that the Director of Military Aeronautics, seated before an ordinary desk telephone in his office, talked to a pilot of the Air Service, who was operating a wireless-equipped aeroplane in the air. The communication involved the use of the telephone lines of the Chesapeake and Potomac systems, and was made at Boling Field, where the apparatus transmits speech over either system automatically. Communications have hitherto passed between pilots in the air and landlines on the field. This conversation, however, was the first official demonstration of a two-way conversation direct between a person using a telephone on a circuit and an aviator in flight.

CONTRACTS OPEN AND CLOSED.

OPEN.

Aberdeen.—Corporation Electricity Department. Five-ton tipping wagon for coals. Electric vehicle preferred, but not essential. See "Official Notices" January 10th.

Australia.—SYDNEY.—April 28th. City Council. Supply and erection of power-house switchgear. Specifications from Electric Lighting Department, Town Hall, Sydney. A copy can be seen at the Inquiry Office of the Department of Overseas Trade (Development & Intelligence), London.

MELBOURNE.—March 4th. Deputy Postmaster-General. Cables (schedule No. 1,504). A copy of the specification may be seen at the Inquiry Office, Department of Oversea Trade (Development and Intelligence).

March 10th. City Council. One 5,000-KW. frequency changer, high-tension switchgear. Specification (£1 1s.) from City Electrical Engineer.

Aylesbury.—B.C. 200 to 400-KW. internal-combustion engine and dynamo complete. See "Official Notices" January 17th.

Belfast.—February 24th. Electricity Department. One 50-ton overhead travelling crane, one 5-ton overhead hand crane, and two 3-ton travelling electric cranes; two 24-in., one 5-in. and one 3-in. electrically-driven centrifugal pumps; five cast-iron water storage tanks.

Belgium.—February 14th. Special interest attaches to the fact that for the first time since the memorial year of 1914 we are able to draw attention to the call for tenders for electrical installation work in Belgium. Thus we learn that the municipal authorities of Herstal, near Liege, are inviting projects until the February 14th, for a system of electricity distribution in the town.

Glasgow.—Supply of complete A.C., 1,500-KW., 50 periods, three-phase, 3,000-volt generating plant, consisting of steam boilers, steam engines, A.C. generators, steam and exhaust piping and valves, surface condensers and water piping, main switchboard and accessories, cabling and sub-station panels, &c. For further particulars see "Official Notices" to-day.

Liverpool.—February 3rd. Tramways Committee. Supply of 50 electric tramcars. Specification, &c., from C. W. Mallins, General Manager, 24, Hatton Garden, Liverpool.

London.—H.M. Office of Works. January 29th. Supply of electric wire and cable to December 31st. See "Official Notices" to-day.

Manchester.—February 11th. Tramways Committee. (*a*) Tramcar motors. (*b*) Tramcar trucks. Specification, &c., from J. M. M'Elroy, General Manager, 55, Piccadilly, Manchester.

New Ross (Co. Wexford).—February 20th. Gas and Electricity Supply Co., Ltd. Suction gas plant and dynamos, storage battery, main switchboard, overhead lines and street lamps. See "Official Notices" to-day.

Sheffield.—Corporation Water Department. Two 3-ton steam locomotive cranes and one 5-ton electric locomotive crane, D.C., 460/500 volts. See "Official Notices" January 10th.

Spain.—The municipal authorities of Jerez de los, Caballeros (Province of Badajos), have lately invited tenders for the concession for the electric lighting of the town during a period of eight years.

Stretford.—February 8th. Electricity and Tramways Committee. Electricity converter station at Old Trafford. Specification, &c., from E. Worrall, Surveyor Council Offices, Old Trafford.

Warrington.—January 28th. Electricity and Tramways Committee. One 300-KW. and one 500-KW. rotary converter. See "Official Notices" January 10th.

CLOSED.

Cape Town.—The Corporation Electricity Committee has recommended that the tender of Messrs. Reunert & Lenz, Ltd., for two 34,000-lb. Babcock & Wilcox marine type water-tube boilers, supplied and erected at a cost of £38,975, be accepted, the Council to provide the necessary foundations.

Glasgow.—Electricity Committee. In connection with the erection of the new power station at Dalmarnock:—

Water softening plant.—Paterson Engineering Co., £1,286.
Flooring tiles for switch-house.—J. T. Gondie & Co., Glasgow.
Steam travelling crane.—J. Grieve & Co., £650.

Tramways Committee. Accepted:—
500 tons of rails.—Bolckow, Vaughan & Co.

Government Contracts.—The undermentioned contracts were placed during December, 1918:—

WAR OFFICE.

Vulcanised fibre.—Sutcliffe (Crumpsall), Ltd.
Motors, &c.—E. Brook, Ltd.; General Electric Co., Ltd.
Transformers.—British Electric Transformer Co., Ltd.

POST OFFICE.

Telegraph apparatus.—Siemens Bros. & Co., Ltd.
Telephone apparatus.—British L.M. Ericsson Manufacturing Co., Ltd.; Western Electric Co., Ltd.
Telegraphic and telephonic cable.—British Insulated & Helsby Cables, Ltd.; Siemens Bros. & Co., Ltd.
Coating brass bodies with lithoid.—New Lithoid, Ltd.
Ear pieces.—North British Rubber Co., Ltd.
Glow lamps.—Siemens Bros. Dynamos Works, Ltd.

H.M. OFFICE OF WORKS.

Engineering works services.—Electric Wiring, G.E. Co.'s Building, Kingsway, W.C.; Lund Bros. & Co.

INDIA OFFICE.—STORE DEPARTMENT.

Brass tubes.—Muntz Metal Co.; Yorkshire Copper Works; J. Wilkes, Son and Mapplebeck; Birmingham Battery & Metal Co.; Broughton Copper Co..
Cable.—Siemens Bros. & Co.
Cells.—J. C. Fuller & Son; General Electric Co., Ltd.
Headgears, &c.—Peel-Conner Telephone Works.
Lamps.—British Thomson-Houston Co., Ltd.
Relays.—Automatic Telephone Manufacturing Co., Ltd.
Telephone sets.—Peel-Conner Telephone Works.
Voltoids.—Brunner, Mond & Co.

Sunderland.—T.C. Accepted tenders:—
H.T. switchgear.—Ferguson, Pailin & Co.
Incandescent lamps.—General Electric Co., Ltd.

FORTHCOMING EVENTS.

Institution of Electrical Engineers (Students' Section).—Friday, January 24th. At 7 p.m. At the Northampton Polytechnic Institute, Clerkenwell, E.C. Paper on "A General Outline of Telephony," by Mr. H. T. Body.

(Western Centre).—Monday, January 27th. At the South Wales Institute of Engineers, Park Place, Cardiff. At 7 p.m. Paper on "The Training of the Electrical Engineer," by Lt. Col. W. J. O'Meara, C.M.G.

(North-Western Centre).—Tuesday, January 28th. At 7 p.m. At the Engineers' Club, Manchester. Paper on "The Supply of Single-phase Power from Three-phase Systems," by Prof. Miles Walker.

Institution of Mechanical Engineers.—Friday, January 24th. At 6 p.m. At the Institution of Civil Engineers, Gt. George Street, S.W. Paper on "Electric Welding," by Mr. J. T. Heaton, and other papers on "Oxy-acetylene Welding."

Greenock Association of Electrical Engineers.—Saturday, January 25th. Visit to Messrs. A. F. Craig & Co.'s Engineering Works, Paisley.

Manchester Association of Engineers.—Saturday, January 25th. At 6.30 p.m. At the Grand Hotel. Discussion on "The Past, Present and Future of Electricity Supply," to be introduced by Mr. S. L. Pearce.

Junior Institution of Engineers.—Monday, January 27th. At 7.30 p.m. At the Royal Society of Arts, John Street, Adelphi. Discussion on "National Electricity Supply."

Industrial Reconstruction Council.—Tuesday, January 28th. At 6 p.m. At the Institute of Journalists, Tudor Street, E.C. Conference on "The Workers' Interest in Costing: A Factor of Industrial Reconstruction," to be opened by Mr. J. Joseph.

Institution of Civil Engineers.—Tuesday, January 28th. At 5.30 p.m. At Gt. George Street, S.W. Paper on "Centrifugal Pumps for Dealing with Liquids Containing Solid, Fibrous and Erosive Matters," by the Hon. R. C. Parsons.

Royal Society of Arts.—Wednesday, January 29th. At 4.30 p.m. At John Street, Adelphi. Paper on "Food Production by Intensive Cultivation," by Dr. F. Keeble, C.B.E., F.R.S., Controller of Horticulture, Board of Agriculture and Fisheries.

THE ELECTRICAL TRADES BENEVOLENT INSTITUTION.

THE following is a list of further contributions of 10s. value and over received in response to the appeal made by Mr. Hunter, the Chairman :—

	£	s.	d.
Anon.	1	1	0
F. Brown & Co.		10	6
Jas. S. Foreman	1	1	0
G. W. Neale		10	6
Wm. W. Lackie	10	0	0
C. Richardson & Sons ...	1	1	0
S. Dixon & Sons	5	0	0
Bertram Thomas	1	1	0
Ward & Goldstone ...	3	0	0
Attwater & Sons	10	10	0
Cromil Eng. Co., Ltd. ...	1	1	0
A. E. Ingle	1	1	0
J. M. Gorham	1	1	0
A. V. Rye	2	0	0
W. Cozens Cooke		10	6
Fred. Lake & Co., Ltd.	1	1	0
Kiesow	1	1	0
Mosers, Ltd.		10	0
Kartret Eng. Co.	1	0	0
C. T. Quicke, J.P. ...	1	1	0
Z Elec. Lamp Co., Ltd.	10	0	0
Hy. Coates		10	6
Robson & Coleman ...	1	1	0
Marconi Wireless Telegraph Co., Ltd. ...	105	0	0
I. Griffiths & Sons ...	1	1	0
Saxonia Elec. Wire Co., Ltd.	1	1	0
A. L. White		10	6
J. F. M. Bennett		10	6
R. H. Houstoun	1	0	0
G. Stanley Mappin ...	1	1	0
L. le Personnet Co. ...	2	0	0
Haydn Harrison	2	2	0
H. Gobie	1	0	0
E. Gimingham	10	0	0
J. F. Caine		10	6
Theodore Settle	3	0	0
Lawton & Sons	1	1	0
Major E. A. Pells, R.E.	1	1	0
Sir David Salomons, Bt.	10	10	0
R. J. Kauen	1	1	0
J. Dodimead & Sons ...	2	2	0
R. Savory		10	6
H. Hirst	10	10	0
G.E.C.	26	5	0
Dugard Bros., Ltd. ...	2	2	0
E. Wilson	3	3	0
M. Solomon	2	2	0
H. Fenemore		10	6
Pritchett & Gold, Ltd.	1	1	0
C. J. Hobbs & Co. ...		10	6
B.E. Co. (of London and Birmingham) ...	1	1	0
G. W. Franklin	1	1	0
C. D. Patterson	1	1	0
Davis & Dawes	1	1	0
F. Braby & Co., Ltd. ...	2	2	0
J. M. Moffatt	1	0	0
A. H. Drewer & Co. ...	2	2	0
Stearn Electric Lamp Co., Ltd.	1	1	0
T. J. Grainger	5	0	0
G. T. Moody	1	0	0
Paragon Rubber Manufacturing Co.	2	2	0
J. Y. Fletcher	5	5	0
F. Broadbent	1	1	0
J. S. Child	3	3	0
H. Harrison	1	1	0
W. E. Burnand	1	1	0
R. Becker & Co., Ltd.	1	1	0
Whipp & Bourne, Ltd.	1	1	0
J. J. Pritty	10	0	0
C. H. Cox	2	2	0
G. B. Etches	1	1	0
W. M. Horsfall	1	1	0
J. Jones	1	1	0
H. Stokes	1	0	0
Cowton & Sons, Ltd. ...	2	2	0
E. M. Evans & Sons, Ltd.	1	1	0
D.P. Battery Co., Ltd.	1	1	0
G. Austin	2	2	0
C. G. Nobbs		10	6
P. T. King	1	1	0
Diamond Fibre Co., Ltd.	5	0	0
Brecknell, Munro and Rogers, Ltd.	1	0	0
Capt. C. W. Speirs ...	2	2	0
C. Nurse & Co., Ltd. ...	2	0	0
T. Burnley & Sons ...		10	0
R. A. Chattock	1	1	0
Solenoid Reg. Co.	1	1	0
Clarke, Hunt & Co., Ltd.	1	1	0
C. W. Cox	5	0	0
J. Gibb & Co., Ltd. ...	2	2	0
A. P. McDonall	1	0	0
W. Thom		10	0
Messrs. Lamlok	1	1	0
Boots Pure Drug Co., Ltd.	1	1	0
E. Allen & Co.	10	0	0
J. Taylor	2	2	0
G. H. Fawcus	2	2	0
Equipment & Eng. Co ...	1	1	0
Falk, Stadelmann and Co., Ltd.	10	10	0
Porter & Co.	1	0	0
E. Bodin	1	0	0
J. W. Elliott	5	5	0
F. W. Potter & Co., Ltd.	5	5	0
Weiss, Biheller & Brooks, Ltd.	2	2	0
F. Birkett		10	6
Vacuum Oil Co., Ltd. ...	1	1	0
J. W. Garsden	4	4	0
W. Dixon	10	10	0
Nalder Bros. & Thompson	5	5	0
E. Fawssett		10	6
T. P. Pollitt & Co., Ltd.	5	5	0
O. M. Andrews	1	0	0
W. E. Highfield	1	1	0
H. M. Brigg		10	0
O. Wheeler		10	0
Kennedy & Donkin ...	5	0	0
W. R. Rivers Moore ...	1	0	0
F. Ritchie		10	0
I. L. Roberts	1	1	0
A. Stanwell	1	0	0
M. J. Railing	5	5	0
E. Coote	2	2	0
J. Dickson		10	6
McGaw & Co.	2	2	0
J. Scott, Ltd.	1	1	0
Buchanan & Curwen ...	1	1	0
A. H. Gilling	1	1	0
W. Marchant	1	1	0
O. Goldstein	2	2	0
F. J. Launcham	2	2	0
G. Pattison	1	0	0
F. W. Parkinson	1	1	0
I.C.E.S.		12	0
J. W. L. Robb	1	1	0
Berkeley & Young, Ltd.	1	1	0
New British Electric Supply Co.	1	1	0
A. W. Prangnell	1	0	0
T. P. Marsh		10	0
F. J. Chapple	1	1	0
H. Walker & Son, Ltd.		10	6
Osborne & Hunter ...	1	1	0
T. B. & W. Cockayne, Ltd.	1	1	0
Everett, Edgcumbe and Co., Ltd.	2	2	0
Marshall, Sons & Co., Ltd.	1	1	0
J. W. Powell	2	2	0
Nettlefold & Sons, Ltd.	1	1	0
Drake & Gorham, Ltd.	2	2	0
J. H. Holmes	2	2	0
Wippel Bros. & Row ...		10	6
T. W. Ward, Ltd. ...		10	6
C. H. Worsnop	1	1	0
R. O. Whipple	1	0	0
H. Smith	2	2	0

OUR HALF-YEARLY INDEX.

THE Index to Vol. 83 of the ELECTRICAL REVIEW, which has now been printed, will be supplied for 3d., post free, to those who, through the post, specially apply for it. Applications should be addressed to the Publisher, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

NOTES.

American General Electric Strike.—There was a strike of 20,000 employés of the General Electric Co., at Schenectady and Erie, in December, following upon the dismissal of 200 men at Erie Works (including 10 Union men), as a result of the cancellation of orders following the signing of the Armistice. It appears that the Union demanded the reinstatement of the men, and other matters, such as the recognition of the Union, were raised. According to an article in the *Electrical World*, the company's orders in 1917 aggregated $247,000,000, whereas orders received during the seven weeks prior to December 14th, 1918, were at the rate of $157,000,000 a year. In the last two weeks of this period they were at the rate of $125,000,000.

Institution and Lecture Notes.—Institution of Electrical Engineers (North-Western Centre).—At Manchester, on Tuesday last week, Mr. Ll. B. Atkinson delivered the tenth Kelvin Lecture on "The Dynamical Theory of Electric Engines" before this Centre. Mr. A. P. M. Fleming, O.B.E., chairman, was in the chair. Mr. J. A. Robertson, who was associated with Lord Kelvin at one of his most active periods, in moving a vote of thanks said that was the first time in ten years that a Kelvin Lecture had been given in the North-Western Territorial Centre, and he hoped that in future years they would have the Kelvin Lectures given regularly at all the Local Centres. He thought that they, as an Institution, ought to be conversant with what Kelvin had done, and he could imagine nothing more unfortunate than that the younger members should be able to use his knowledge and his inventions without having any proper idea of the work he carried out or what he contributed to the business in which they were all engaged.

(SCOTTISH CENTRE).—At Edinburgh, on Tuesday last week, Prof. Miles Walker, D.Sc., read his paper on "The Supply of Single-phase Power from Three-phase Systems," before this Centre, Mr. J. F. Neilson, chairman, being in the chair.

Association of Mining Electrical Engineers.—At a meeting of the Yorks. Branch of the Association, held at Doncaster last Saturday week, a paper was read by Mr. W. Jones, of the "C. O." Co., on "The Working of Miners' Electric Lamps," in which he strongly advocated more systematic methods in lamp cabins, and the better supervision of lamps by duly qualified and adequately paid men. A visit to the Lofthouse Colliery is to be made on February 15th.

Belfast Association of Engineers.—On the 17th inst., at the Technical Institute, Belfast, Mr. Kendrick Edwards, gave a lecture on "Electric Arc Welding," and the great advances which had been made in the process during the war. Welding plant was demonstrated by a number of lantern slides, covering a broad field of work. A discussion followed.

Nottingham Society of Engineers.—On Wednesday, last week, Mr. H. M. W. Royce, of the British Westinghouse Electric and Manufacturing Co., read a paper on "Industrial Electric Motor Control."

Manchester Association of Engineers.—At the meeting to be held to-morrow, to discuss "The Past, Present, and Future of Electricity Supply"—a vast enough subject, in all conscience—Mr. S. L. Pearce and Mr. J. G. Robertson will open the proceedings. Mr. Pearce will deal with past legislation, the position of electricity supply abroad, as contrasted with British practice, the various memoranda and recommendations of committees on the interconnection and reorganisation of supply undertakings, and the question of future policy in the development of the industry in this country, including the technical problems connected with power stations and transmission. The occasion will clearly be one of considerable interest and importance.

Volunteer Notes.—ROYAL ENGINEERS VOLUNTEERS, LONDON ARMY TROOPS COMPANIES.—Headquarters: Balderton Street, Oxford Street, W. 1.

Regimental Orders No. 4, by Lieut.-Colonel C. B. Clay, V.D., Commanding.
Monday, January 27th, to Saturday, February 1st, drills as usual.

C. HIGGINS, Captain, R.E., *Adjutant*.

Fatalities.—A verdict of "Death from electric shock—misadventure," was returned at an inquest at Hyde on Ernest Wimpenny (10). The deceased, with other boys, was playing with a telephone wire which had fallen across three cables belonging to the Turbine Gears, Ltd., which ran from the Joint Tramway Board's sub-station. Arthur Hudson, engineer at the sub-station, said the voltage was 230.

T. J. Derman, an electrician in the employ of the King William's Town, Cape Province, Municipality, whilst working on the overhead wires, made contact with his face on a live wire, and was instantly killed.

We read in a South African paper that a boy was killed recently at a bungalow at Humewood, Port Elizabeth. It appears that his parents and he had rigged up an extension to the existing lights, but certain defects had developed, and on the boy's bare feet coming in contact with the damp sand, he received a shock that killed him instantaneously.

A Milnsbridge man, J. Lindley, aged 28, was on Tuesday last week killed at the mills of Messrs. James Shires & Sons, Lockwood, near Huddersfield. The gate of a hoist-cage had become electrified by the displacement of the lock, and Lindley, in attempting to open the gate, lost his life through receiving a shock at 400 volts. Verdict, "Accidental death."

British Trade with Greece.—Major Kennard, representative of the Federation of British Industries, is returning from Greece to England to report on his investigations as to openings for British trade in Greece. His report will be entirely favourable.—*Times*.

Standing Conference of Electricity Supply Associations.—Mr. W. B. Woodhouse has been elected chairman of this Conference for the ensuing year in place of Mr. C. P. Sparks, who has occupied the chair during the past year. Mr. J. W. Beauchamp has been elected honorary secretary of the Conference for the ensuing year in place of Mr. H. Faraday Proctor. The Conference is formed of the four Associations as follows :—Incorporated Municipal Electrical Association (Mr. H. Faraday Proctor, hon. sec.); the Conference of Chief Officials of London Electric Supply Companies (Mr. F. J. Walker, hon. sec.); the Incorporated Association of Electric Power Companies (Mr. A. de Turckheim); the Provincial Electric Supply Committee of the United Kingdom (Mr. T. W. Cole.)

Appointments Vacant.—Shift engineers (60s. + 12½ per cent.), wiremen (50s. + 12½ per cent.), for the War Department Power Station, Upton Lovell, Wilts.; power station staffs for the Northern Command; station fitters (57s. 6d. + 12½ per cent.), engine drivers (steam and internal combustion), (42s. 6d. + 12½ per cent.), wiremen (45s. + 12½ per cent.), linesmen-jointers (57s. 6d. + 12½ per cent.), for the Southern Command Generating Stations; lecturer in Electrical Engineering (£250), for the University of Bristol; cable jointer (55s. + awards), and draughtsman with electrical knowledge, for the Epsom U.D.C. Electricity Works; two overhead linesmen, plumber jointer, and boiler-house mechanic, for the Kilmarnock Corporation Electricity Supply; armature winders, controller fitters and electricians, for the Manchester Corporation Tramways. See our advertisement pages to-day.

Disabled Men as Drivers.—The Home Secretary has appointed Mr. A. L. C. Fell, general manager of the London County Council Tramways, to be an additional member of the Committee on the subject of the licensing of partially disabled men as drivers of public motor-vehicles.—*Times.*

Inquiry.—Makers of single-phase A.C. generators from 8 to 30 KW. are asked for.

Berlin Troubles.—The *Times* correspondent at the Hague, telegraphing on Tuesday last, referring to reported trouble that night in Berlin, said:—"The workers of the A.E.G. struck work at 5 o'clock, and Berlin is in darkness. The telephone also is not working for private conversations."

American Priorities Cancelled.—The *Electrical World* notifies that an official circular, addressed to all concerned, reads as follows: "Effective, January 1st, 1919, all rules, regulations, and directions of every nature whatsoever issued by the Priorities Division of the War Industries Board are hereby cancelled, and all pledges heretofore made on the suggestion or request of the said Division are hereby revoked."

It is also said that the lamp conservation programme involving restrictions upon inefficient incandescent lamps has been abandoned.

Chief Engineers' Salaries.—The Assoc. Mun. Electrical Engineers (Greater London) have communicated with London electricity supply authorities, asking that the following scale of salaries be adopted for chief engineers, as being the minimum that can be accepted: Where the number of units sold per annum is less than two million, £600 per annum; between two and five million, £650; between five and ten million, £700; between ten and twenty million, £750; over twenty million, £800. Additional payments are also to be made, based on the maximum demand, number of consumers, and units sold, also war bonuses granted to workmen are to be extended to chief engineers. The application requests that the scale be dated back to March 21st, 1918, that no member shall suffer any reduction thereby, that other appointments held shall not affect a member's salary as electrical engineer, and that the results up to March 31st each year determine the salary to be paid during the ensuing year.

Electrical Contracting Industrial Council.—The *Times* states that the Joint Industrial Council of the Electrical Contracting Industry, at its first meeting at Leeds, on Wednesday, agreed to establish for the industry a uniform 47-hour working week, payable on a basis of a 53-hour week, to begin on the first full working week following January 27th.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with th technical or the commercial side of the profession and industry also electric tramway and railway official-, to keep readers of th ELECTRICAL REVIEW *posted as to their movements.*

Central Station and Tramway Officials.—Mr. H. C. BABB, for three years resident engineer and manager at the Bo'ness electricity works, has been appointed general manager of the Musselburgh District Tramways and Lighting Co. He is meantime to retain supervision of the Bo'ness station.

At Lancaster, last week, Private P. TAYLOR, M.T., A.S.C., assistant electrical engineer to the Darwen Corporation, was married to Miss A. T. Taylor, of Lancaster.

Barnsley T.C. has appointed Mr. J. WETHERELL, of Upton Lovell (Wilts.), as electrical assistant at the electricity works at £215 per annum.

Aylesbury T.C. has granted £100 to the electrical engineer (Mr. W. A. TURNBULL) for extra work in connection with the installation of a gas producer plant.

The marriage took place at Christ Church, Epsom, last week, of Mr. E. H. MANLEY, chief assistant engineer to the South Metropolitan Electric Tramways Co., Ltd., and Miss G. M. Pritchard. The presents included a bookcase from the company.

Inspector SMALLEY, of the Oxford Electric Tramways Co., Ltd., has been appointed traffic superintendent for the Musselburgh Electric Tramways, and on leaving has been presented with a cigarette case.

Mr. T. ROLES, the Bradford city electrical engineer, who recently experienced a breakdown in health, is again back at his duties.

Wolverhampton T.C. has increased the salary of Mr. C. O. SILVERS, general manager of the Corporation tramways, from £450 to £600 per annum. It was stated that with this advance Mr. Silvers will have had an increase of £400 during six years.

Shoreditch B.C. Law and Establishment Committee recommends that the salary of Mr. W. WEEKES, chief assistant electrical engineer, be increased from £250 to £350 per annum.

The Heywood Electricity and Tramways Committee has increased the salary of Mr. D. H. DAVIES, borough electrical engineer and tramways manager, by £50 per annum.

Mr. W. E. CLARET has resigned the position of chief engineer of the power plant of the British Xylonite Co., Ltd., Hale End, London, on accepting an appointment under the County Borough of Stoke-on-Trent electricity supply department.

General.—Prof. C. A. MIDDLETON SMITH, of Hong-Kong University, will be leaving Hong-Kong at about the end of March for a period of leave in England. He hopes to reach home early in May.

Mr. H. J. FELL, manager of the Chelmsford works of Messrs. Crompton & Co., Ltd., who is retiring after 15 years' service, has been presented by the employés with a fitted suit case.

Mr. P. FRAMPTON, late of Messrs. Bottomley, Frampton and Co., Blackpool, has commenced his duties as works manager for Mr. George Morrison, 24, Birley Street, Blackpool.

Mr. R. B. HAND has left Messrs. Scholey & Co., Ltd., having entered the service of Messrs. Thacker, Bell & Co., Ltd., 44, Leadenhall Street, for whom he will take control of their electrical department.

By public announcement, Mr. E. HERMAN FRIEDRICH HOTOFF, of Beckenham, a British-born subject, has changed his name to Ernest Frederick Holden.

As the advent of peace has terminated his duties at the Admiralty, Major J. CALDWELL resumes his position with his firm (James E. Sayers & Caldwell, Glasgow), and, as from Monday, 3rd prox., will establish himself in London at Parliament Mansions, Victoria Street, S.W. In addition to general consulting work, Major Caldwell will devote particular attention to electric welding, which, during his service with the Admiralty, he has been engaged in developing and extending at munition factories and shipyards, both in this country and abroad.

Mr. C. W. HILL has now been demobilised from the Navy and has resumed his position of director of Messrs. Scholey and Co., Ltd.

On Thursday evening, January 16th, a social evening was held at the Woodland Works (Chadwell Heath) of Messrs. John C. Fuller & Son, Ltd., when Mr. George Fuller, chairman and managing director, met the members of the staff at a reception. The guests were welcomed by Mr. and Mrs. Fuller, and numbered about 150. Refreshments were provided in the new canteen, which was specially decorated for the occasion, and a high-class concert was given conducted by Miss Mabel Dawkins. During the evening there was a surprise presentation of a bouquet to Mrs. Fuller, on behalf of the staff. The directors and some of the principal shareholders were present.

Roll of Honour.—The Military Medal has been awarded to Private V. H. A. KIMBERLEY, A.S.C., who was formerly in the employ of the General Electric Co., Ltd., at Witton.

Corporal V. M'GLYNN, or Pendleton, Manchester, who has been awarded the Military Medal, was an employé of the British Westinghouse Co., Ltd., Trafford Park.

Sergeant H. DENNIS, of the 1/5th Loyal North Lancashire Regiment, mentioned in dispatches, was formerly employed at the Bolton Electricity Works.

Sapper T. LIVESEY, R.E., who has died at Salonica from dysentery and malaria, was formerly engaged with Messrs. William Gaskell & Son, electrical engineers, of Wigan.

Private J. W. MANSER, Tank Corps, formerly a member of the Ealing Borough electrical engineer's staff, has returned after five months' captivity in Germany.

Obituary.—MR. ALBERT EDWARDS.—The *Times* records the death of Mr. Albert Edwards, who was one of the first telegraph operators in England. "He worked on the old private lines in the West of England, South Wales, and Scotland before the telegraph service was taken over by the State. For many years he was in charge of the telegraph office at Dover Admiralty Pier. Mr. Edwards was a voluminous writer to the various postal service magazines."

We desire to tender our sympathy to Dr. and Mrs. S. Z. de Ferranti in the sad loss they have sustained through the death of their third daughter (aged 16), which occurred at their residence at Baslow, on January 16th, after an operation for appendicitis.

MR. C. R. WALKER.—The death has taken place at Torquay of Mr. Charles Robert Walker, manager of the Mansfield and District Tramway Co., Ltd., and of the Notts and Derby Tramway Co., Ltd. He was 48 years of age, and was a prominent Freemason.

MR. J. B. MASON.—The death occurred on January 13th of Mr. John Bancroft Mason, electrician in charge of the installation on the estate of Mr. H. A. Colefax, K.C., of

Old Buckhurst, Withy Lane, Tunbridge Wells. Deceased, who was 50 years of age, died from paralysis caused by a fall last September.

Captain G. Whitaker.—In the *Times* "Deaths" column we read that on December 19th, 1918, there passed away, at the age of 34 years, at Namtu, Burma, Capt. Gilbert Whitaker, M.I.M.E., M.I.E.E., chief engineer, Burma Mines, Ltd.

NEW COMPANIES REGISTERED.

Manufacturing Engineers, Ltd. (152,605).—Private company. Registered January 13th. Capital, £2,000 in £1 shares. Consulting, civil, electrical, constructional, marine, aeroplane, cycle, motor, and general engineers, &c. The subscribers (each with one share) are:—S. Wallace Wilkins, 19, Lanhill Road, Maida Vale, W., electrical engineer; C. S. Sizer, 295, Gray's Inn Road, W. 1, electrical engineer. Permanent directors: E. P. Barfield and S. W. Wilkins. Registered office: 283, Gray's Inn Road, W.C.

Electric Vehicles, Ltd. (10,197).—Private company. Registered in Edinburgh, January 6th. Capital, £5,000 in £1 shares. Agents for the purchase, sale, and hire of electric vehicles, &c., constructors and repairers of and dealers in automobiles, &c. The subscribers (each with one share) are:—S. A. J. Grimes, 11, Bothwell Street, Glasgow; C. J. Seller, 144, St. Vincent Street, Glasgow. The first directors are not named. Registered office: 144, St. Vincent Street, Glasgow.

Birr Electric Light & Power Co., Ltd. (4,643).—Registered in Dublin, January 10th. Capital £8,000 in £1 shares. Objects, as title. The subscribers are:—T. R. Garvey, Woodville, Birr, 100 shares; D. P. Proctor, Green Street, Birr, 500 shares; E. C. Dooley, Main Street, Birr, 100 shares; J. Dooly, Wilmer Road, Birr, 100 shares; W. J. Meara, Main Street, Birr, 100 shares; W. A. F. Barry, John's Place, Birr, 100 shares; A. Wright, Birr, 50 shares. First directors: T. R. Garvey, D. P. Proctor, E. C. Dooley, J. Dooly, and W. F. Meara. Registered office: 7, Ross Row, Birr.

CITY NOTES.

The Calcutta Electric Supply Corporation, Ltd.—The number of units sold to consumers has been as under:—

	1918.	1917.
Four weeks ended September 27th	2,761,058	2,354,138
Four weeks ended October 25th	2,488,926	2,240,246
Five weeks ended November 29th	2,829,274	2,479,429

Yorkshire (West Riding) Electric Tramways Co., Ltd.—Dividend of 6 per cent. per annum, less tax, on the preference shares. Funded preferential dividend certificates purchased, £11,187; to renewals, depreciation, reserve, &c., £12,310; carry forward, £2,525.

Liverpool Overhead Railway Co.—Final dividend (for the half-year ended December 31st last) at the rate of 5 per cent. per annum, less income-tax, on the preference shares, and 4 per cent. per annum, less income-tax, on the ordinary shares, making for the year 5 per cent. on the preference shares and 3½ per cent. on the ordinary shares.

Montreal Light, Heat & Power Co.—Quarterly dividend 2 per cent.

STOCKS AND SHARES.

Tuesday Evening.

There is no slackening in the volume of Stock Exchange activity, and business broadens daily amongst the Industrial sections. Labour restlessness is having very little effect upon the anxiety of investors to buy shares from which a good return is obtainable. Only in the railway markets does this factor make for any appreciable caution. With the termination of the period for the National War Bonds there has come an unloosing of purse-strings for other securities. Many stocks and shares are easier to sell than they are to buy.

The Underground Railway group has reacted from the best. Underground Incomes rose to 96, but the enthusiasm became a little abated on the businesslike statement issued by the board in reply to the plea put forward by the Bondholders' Committee, in which the latter suggested that—in plain words—more money should be distributed to the proprietors. The board point to the necessity of providing funds against renewals, repairs, and other such items of expenditure. Their reply was read as a hint that the income bondholders will do well not to expect too much at present, but the reaction of 1½ in the price is, after all, very trifling.

To the holder of the season-ticket on the District, to the traveller on the Piccadilly, City & South London, and Hampstead Tubes the constant wonder presents itself at the avoidance of accidents. To deal with the problem of London transportation must involve the continual hope that more men may be quickly released for the work of repairs and renewals. As things are, the conditions seem to grow daily more congested and the crowding more dangerous.

Districts have risen to 29. Metropolitans advanced to 32½ before reacting to 31. Underground "A" shares have been up to 12s., and are now 11s. The £10 issue hangs fire, and at 3½ the shares look relatively less expensive than those of the shilling class. Contingent certificates have attracted a certain interest at about 1s. 7½d. They are a gambling counter.

Publication of the terms proposed for the reconstruction of the London United Tramways show that previous years of a drastic lopping-off of capital were well-founded. The debenture holders are asked to consent to an exchange of their present £100 stock into £52 new debenture, £52 new 6 per cent. preference, and £5 new ordinary. To put the concern on its legs as a remunerative company the cut is probably not worse than necessary. Over-capitalisation has dogged the London United Tramways for years past, and reorganisation of the finances ought to have been taken in hand long ago. The scheme is regarded in the Stock Exchange as a fair proposition, and, with revised fares, the payment of debenture interest on the new stock is considered assured, while there is reasonable hope of the preference dividend being duly met.

Metropolitan Tramways 4½ per cent. debenture is 2 higher at 73½. British Electric Traction has risen to 50½: a "tip" is going round to buy the stock. Any low-priced tramway shares are wanted.

Electric lighting shares remain quiet and firm. The manufacturing group is hard. Edisons are 9d. up at 20s. Rumour busies itself with possibilities of amalgamations in electrical circles. Electric Constructons eased off to 23s. 9d. General Electric preference are ¼ weaker. Callenders have risen to 11, and Babcocks to 4. Edmundson's are better at 13s. 6d., and the 6 per cent. preference at 30s.

Foreign traction issues are dull and heavy. Mexicans show little life. Monterey Fives advanced to 49, but Mexican Electric Light Fives are lower at 54. British Columbia Electric descriptions remain depressed. Canadian General Electric recovered to 114½.

No fresh features have developed amongst telegraphs and telephones. Marconis keep about 4½, Americans 29s., and Marines 3½. There is not much doing in them. Rubber shares are strong throughout, with a big business in all the Dutch descriptions.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1916.	Dividend 1917.	Price Jan. 21, 1919.	Rise or fall.	Yield p.c.
Home Electricity Companies.					
Brompton Ordinary	9	10	7⅞	—	£6 15 7
Charing Cross Ordinary	5	4	3⅜	—	5 10 4
do. do. 4½ Pref.	4½	4½	9⅛	—	6 8 7
Chelsea	3	5	4	—	6 5 4
City of London	8	8	13½	—	6 0 9
do. do. 6 per cent. Pref.	6	6	10⅛	—	5 18 5
County of London	7	7	11	— ¼	6 7 3
do. do. 6 per cent. Pref.	6	6	10⅛	—	5 18 5
Kensington Ordinary	6	7	6	—	5 16 8
London Electric	Nil	Nil	1⅜	—	Nil
do. do. 6 per cent. Pref.	4	5	4	—	6 5 0
Metropolitan	3	4	3	—	6 13 4
do. 4½ per cent. Pref.	4½	4½	8½	—	6 16 6
St. James' and Pall Mall	8	9	7½	—	6 4 2
South London	5	5	5	—	6 18 4
South Metropolitan Pref.	7	7	21/-	—	6 13 4
Westminster Ordinary	7	9	7⅜	—	6 2 0
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref.	6	6	98½xd	—	6 1 10
do. Def.	1½	1½	22xd	—	7 12 0
Chile Telephone	8	8	7½xd	—	5 6 8
Cuba Sub. Ord.	7	7	10⅝	—	*6 13 4
Eastern Extension	8	8	15½xd	—	*5 3 3
Eastern Tel. Ord.	8	8	157	—	*5 1 7
Globe Tel. and T. Ord.	7	7	14⅜	—	*4 16 5
do. do. Pref.	6	6	10½	—	5 14 3
Great Northern Tel.	24	22	82½	—	5 15 0
Indo-European	13	13	58½	—	5 11 6
Marconi	15	20	4½	—	4 9 0
Oriental Telephone Ord.	10	10	2½	—	4 0 0
United R. Plate Tel.	8	8	7¾	— ¼	*5 1 7
West India and Panama	6d.	1/9	1⅛	—	*3 13 6
Western Telegraph	8	8	10⅜	—	*4 16 3
Home Rails.					
Central London Ord. Assented	4	4	65½	—	6 2 2
Metropolitan	—	1	31	—1	3 4 6
do. District	Nil	Nil	29	+1	Nil
Underground Electric Ordinary	Nil	Nil	8⅜	— ¼	Nil
do. do. "A"	Nil	Nil	11/-	+9d.	Nil
do. do. Income	6	4	93½	—1½	*4 5 7
Foreign Trams, &c.					
Adelaide Sup. 6 per cent. Pref.	6	6	42	—	6 6 4
Anglo-Arg. Trams. First Pref.	5½	5½	3⅝	—	—
do. do. 2nd Pref.	5½	—	3⅜	—	—
do. do. 5 Deb.	5	5	73½	—	6 18 0
Brazil Tractions	—	—	56	—	—
Bombay Electric Pref.	6	6	102	—	5 11 7
British Columbia Elec. Rly. Pfce.	5	5	67½	—	7 11 5
do. do. Preferred	Nil	Nil	48	—3	Nil
do. do. Deferred	Nil	Nil	45	—	Nil
do. do. Deb.	4½	4½	69	—	6 17 8
Mexico Trams 5 per cent. Bonds	Nil	Nil	66	—1	Nil
do. 6 per cent. Bonds	Nil	Nil	89	—	Nil
Mexican Light Common	Nil	Nil	38	—	Nil
do. Pref.	Nil	Nil	48	—	Nil
do. 1st Bonds	Nil	Nil	69½	— ½	—
Manufacturing Companies.					
Babcock & Wilcox	15	15	4	+ ½	3 15 0
British Aluminium Ord.	10	10	1⅜	—	5 8 1
British Insulated Ord.	20	20	2½	—	4 9 0
British Westinghouse Pref.	7½	7½	2⅜	—	6 0 0
Callenders	20	25	11	+ ½	5 18 8
do. 6½ Pref.	6	6	5⅞	—	5 3 4
Castner-Kellner	25	20	3⅞	+ ⅜	6 16 5
Edison-Swan, "A"	—	—	20	+9d.	7 10 0
do. do. 4 per cent. Deb.	4	4	74½	—	5 6 0
Electric Construction	7½	10	1⅜	—	8 0 0
Gen. Elec. Pref.	6	6	10½	— ½	6 6 10
do. Ord.	10	10	17⅝	—	*5 12 8
Healey	25	25	2½	—	5 11 2
do. 4½ Pref.	4½	4½	4	—	5 12 6
India-Rubber	10	10	17½	—	*5 16 0
Telegraph Con.	20	20	43	—	*5 9 9

* Dividends paid free of Income Tax

Exports and Imports of Electrical Goods during October, November, and December, 1918.

THE official returns of electrical exports and imports for the last quarter of the year record, as regards exports, values of £263,501 in October, £229,031 in November, and £307,370 in December, as compared with £232,708 in July, £246,080 in August, and £280,438 in September, giving a total of £799,902 for the December quarter, an increase of £40,000 on the preceding three months, principally in the item for electrical machinery. The figures for electrical exports for the past month totalled £3,223,959, or an average of £268,600 a month.

The electrical imports for the past three months show a further falling off in values, the figures being, for October, £143,092; November, £124,077; and December, £85,416; as compared with £152,091 in July, £116,656 in August, and £124,233 in September.

The figures for re-exports of foreign and overseas electrical material show a slight increase, the totals being—October, £6,196; November, £10,092; December, £1,332; as compared with—July, £3,078; August, £3,331; September, £6,630.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS AND MACHINERY DURING OCTOBER, NOVEMBER, AND DECEMBER, 1918.

	October.			November.			December.		
	Exports.	Imports.	Re-exports.	Exports.	Imports.	Re-exports.	Exports.	Imports.	Re-exports.
Electrical goods and apparatus unenumerated	£35,508	£40,447	£2,392	£33,008	£33,014	£4,300	£39,660	£14,721	£1,070
Insulated wire and cable (not telegraphic or telephonic)	24,617	2,279	—	14,541	1,932	500	26,019	—	—
Electric glow lamps	5,269	53,831	1,637	6,125	25,883	4,193	4,172	5,977	—
Arc lamps and parts (not carbons)	1,152	8,714	—	159	10,945	—	1,363	2,621	51
Meters and instruments	8,436	570	—	16,615	3,853	196	12,366	8,126	—
Electrical machinery (including switchboards and transformers)	102,930	27,097	398	87,547	33,725	822	73,799	31,294	211
Batteries	15,647	7,669	—	6,445	8,746	—	12,102	11,487	—
Carbons	616	799	725	552	2,792	—	638	2,676	—
Telegraph and telephone cable, wire, and apparatus	69,326	2,496	1,044	63,739	3,187	81	137,251	8,514	—
Totals	£263,501	£143,902	£6,196	£229,031	£124,077	£10,092	£307,370	£85,416	£1,332

ELECTRICITY SUPPLY PROGRESS IN WAR TIME.

(*Continued from Vol. 83, page 643.*)

BOLTON.

The electricity department of the Bolton Corporation (Mr. W. J. H. Wood, borough electrical engineer) has been very active during the war. Although the call for munitions of war has not brought new industries to Bolton, the established engineering works very soon adapted themselves to producing war material, and their output has been considerable. As the recognised home of cotton spinning, Bolton has also produced a large proportion of the yarn required for the manufacture of aeroplane and balloon cloth.

The electricity department has been responsible for supplying the motive power required; the output for the year ending March 31st, 1914, was about 13¾ million units, whereas the output for the year ending March 31st, 1918, was just over 23 million units.

The plant extensions include a turbo-alternator of 8,000-KW. capacity, and two water-tube boilers rated at 34,000 lb. of steam per hour each. The main switchgear has been extended, and a considerable amount of work done in connection with the distribution system.

The demand for electrical energy for all purposes keeps on increasing, and in the very near future the department will again have to extend and install additional plant for dealing with the requirements of prospective consumers.

BRIGHTON.

Owing to the geographical position of Brighton, the Corporation's electricity undertaking (Mr. John Christie, engineer and manager) has been very severely hit with regard to lighting restrictions. Shortly after war broke out the whole of the street lighting was absolutely discontinued, no outside shop or window lighting of any sort being allowed, and the lighting on the piers was also entirely discontinued, with the result that there was a very serious falling-off in the higher-priced lighting units.

Munition works, aeroplane factories, and clothing industries, however, were established in the area, and the increased power load derived from these sources practically maintained the output at the pre-war level, the ratio of lighting and power units being now about 20 and 80 per cent. respectively, as against 43 and 57 per cent. before the war.

The Corporation has also had to supply urgent temporary power for works in connection with the Admiralty, putting down some special plant to meet it.

A large diamond-cutting factory is now in course of erection, and already partially running. When this is completed it is estimated that some 600 H.P. will be required. The supply to be given is A.C., three-phase, and a special sub-station is being provided for this purpose on the premises, to house three 300-K.V.A. transformers with the necessary switchgear.

Now that the restrictions are partially removed, the street lighting is being reinstated and generally lighting throughout the town substantially increased, and there is every possibility of considerable development of industry in the area in the near future. To provide for this, a new 4,000-KW. turbo-alternator is on order for early delivery. It is to replace a 1,600-KW. double-flow Westinghouse turbine installed some 14 years ago, which is now obsolete.

No extension to the boiler-house plant has been made, but in order to deal more efficiently with the poor-quality fuel supplied during the past few years, three of the boilers have been equipped with the latest type underfeed travelling-grate stokers with forced draught.

KILMARNOCK.

Up to the year 1914 the Kilmarnock electricity supply area only covered the burgh of Kilmarnock. The generating plant in the station consisted only of high-speed engines and direct-current generators, and the whole system of supply was direct current, three-wire. The maximum plant capacity was 1,030 KW., and the highest maximum load recorded during the winter of 1913 was 1,300 KW. At the beginning of the year 1914 the Corporation (Mr. W. C. Bexon, burgh electrical engineer and tramway manager) applied for powers to extend the area of supply, and the new area scheduled consisted of approximately 180 square miles of the county of Ayr, including the burghs of Troon, Irvine, Galston, Newmilns, and Darvel. This extension was sanctioned, and the work was commenced in March of 1914.

A 1,500-KW. generator was installed in August, 1914, together with a new boiler-house plant. A further 3,000-KW. set was installed in December, 1915, and a 5,000-KW. turbo-alternator and two 30,000-lb. boilers were installed in March, 1918.

The work of laying mains in the above-mentioned burghs, and the erection of the extra-high-tension lines to supply them, was commenced in June, 1914, and a supply was available in all the burghs by November, 1915. The burgh of Irvine was connected in February, Troon in April, Galston in March, Newmilns in August, and Darvel in November. In addition, during this period a number of factories and coal pits *en route* were connected up to the supply.

Early in the spring of 1917 an extra-high-tension loop transmission line was erected to meet the increased demands at Irvine and district. Since the beginning of 1914, 10,000 KW. of plant has been installed in the power station, and 2,500 KW. of rotary-converter plant in the sub-stations and on consumers' premises. Some 50 miles of extra-high-tension, 11,000-volt transmission lines have been erected, and approximately 10 miles of underground cable laid. Unfortunately, owing to the restrictions, the connecting-up of the mills in the Newmilns and Darvel districts, has been postponed since 1916, but the work will now be proceeded with immediately.

At the present time the undertaking has applications for supply to the extent of 5,000 H.P., and in the scheme of extending its present area of supply, application already having been made, which includes two other burghs, a further 3,000 H.P. is anticipated.

During the war the output has increased from 2,500,000 to 14,000,000 units per annum.

ROTHERHAM.

Much activity and important extensions are taking place in the Corporation electricity supply department (Mr. Edward Cross, engineer and general manager). For the year ending March 31st last, the number of consumers was 949, an increase of 146 during the last four years, and the total units

sold reached 21,490,165, or an increase of 5,943,016 in the same period. During the war the old station has been nearly doubled in capacity, two turbo-alternator sets having been added, each of 5,000 KW. Difficulty was experieneed in finding room for these sets, one of which overlaps two of the older sets, it being placed between and above them. In the boiler-house extensions had also to be made to deal with the increased load, besides which a new pump-house was built, and extra coal-handling facilities were provided. Further, a tunned was excavated beneath the boiler-house, and a conveyor installed to deal with the ashes. The excavation necessitated the under-pinning of three boilers, which work was carried out while the boilers were on load. It soon became evident that further extensions were necessary, and in view of the cramped position of the old station it was decided to build a new station on the opposite side of the road. The then Director of Electric Power Supply placed at the disposal of the Corporation, free of charge, a complete set of drawings, specifications, &c., of the Melbourne power house (designed by Col. McLellan's firm for the Victorian Government) to enable the Corporation to save months of delay. This new station, now in course of erection, will contain two 12,500-KW. turbo-alternators and a 30,000-KW. set, together with the necessary switch gear, auxiliary, and boiler-house plant to steam the whole. On completion, the new station at 6,000 volts and the old one at 3,000 volts are to be interconnected through a bank of Ferranti transformers of 5,000 K.V.A. The plant capacity of the undertaking on June 30th, 1914, was 5,150 KW. From that date to October 31st, 1918, the additional plant installed or authorised was of a total of 65,350 KW., so that the two stations, when the new one is completed, will bring the capacity of the undertaking up to 70,500 KW. This extension for the purpose of priority was graded P.2 by the Director of Electric Power, and some idea of the future size of the undertaking can be formed from the fact that several thousand pounds are being spent on laying mains to one consumer—a large rolling mill—who will alone account for 60 millions of units per annum. It has been estimated that the new plant will be available for operation by the coming summer.

BRISTOL.

The Bristol Corporation electricity department (Mr. H. Faraday Proctor, chief engineer and general manager) has had the satisfaction of being able to report considerable expansion during the war period. Under the following headings a summary of the developments of the undertaking from 1915 to date is given :—

	1915.	1916.	1917.	1918.
Units generated	22,156,500	26,686,000	30,103,937	32,414,990
Max. peak load (KW.)	8,478	9,874	9,599	10,918
Plant installed (KW.)	15,050	15,050	15,050	18,050
Coal used (tons) ...	35,984	44,623	51,983	44,785
Coal per unit generated (lb.) ...	3·638	3·756	3·868	3·095

Although a considerable amount of improvement in demand, output, and economy is evidenced from the foregoing figures, Bristol has not had the good fortune of some of the Northern and Midland towns which, owing to the steel industry, have been centres of operations during the war. It has, however, had demands made upon it by the Admiralty using the Avonmouth Dock, inasmuch as the dock being admirably equipped, it was selected as one of the ports of embarkation for troops and materials of all descriptions. In addition to war supplies, the requirements of the civil population have been dealt with through the port of Bristol, the loads on the clothing, boot, and tobacco factories, especially the latter, bearing ample testimony to this effect. In the same district as the docks, munition works and factories for the manufacture of explosives have been erected, whilst the National Smelting Works also find a place in the vicinity. The Admiralty also selected a site on the opposite side of the river for the construction of a standard shipbuilding yard. The combined demands from these developments have necessitated the electricity undertaking purchasing a further 6,000-KW., 3,000-R.P.M., three-phase British Westinghouse turbo-alternator complete with condensing plant. This additional plant is being installed in a portion of the engine room which was originally intended for a workshop, as owing to war conditions it was found impossible to interfere with the smaller units of plant. The boiler-house capacity of the station was, however, too small to meet the increased demand anticipated during the coming year, and a further extension is in course of erection. This extension provides for the installation of four vertical water-tube boilers, each 5,400 sq. ft. heating surface, by Messrs. John Thompson, Ltd., fitted with Ferguson superheaters. These boilers are placed two in a battery, with Green's standard economisers placed above the boilers and the induced-draught plant over the economisers. One stack will be provided for the four boilers, and the induced-draught plant divided into two. The stokers are "underfeed" travelling grate of the integral type, *i.e.*, each stoker is fitted with its own forced-draught plant complete. It is hoped that this equipment will deal with a greater variety of fuel, as owing to the geographical position of Bristol anything from coke-breeze and anthracite to bituminous coal is at its disposal.

(To be continued.)

CARBON BRUSHES: CONSIDERED IN RELATION TO THE DESIGN AND OPERATION OF ELECTRICAL MACHINERY.

AT Leeds, on January 14th, Mr. P. Hunter-Brown's paper (an abstract of which appeared in our issue of December 27th, 1918) was read and discussed before the North-Midland Centre of the I.E.E.

MR. R. H. CAMPION, chairman, in opening the discussion, said they were all indebted to the author of the paper for giving them such a full description of the behaviour of carbon brushes. It was over twelve years since he had standardised all the dynamo brushes under his care, with small brushes and aluminium holders with copper gauze flexible gear, and had attained very satisfactory results. He knew of one manufactory where three different departments recommended three different types of brushes, and he had come to the conclusion that manufacturers generally preferred purchasers to experiment and find out the most suitable size, even after they had given all the details about the machine. He believed that a good deal of the trouble which had arisen had been due to a very poor, inefficient, and cheap type of brush gear adopted by one manufacturing firm, and copied by many others, because they thought it was standardised. What was the author's definition of "sparkless"? He (the speaker) had been amused at various times at seeing different dynamos sparking, and had been generally told: "That is a harmless spark, that is something else." Interesting points of the paper were the particulars given of the two sets of brushes supposed to be working at 40 amperes per sq. in., and which had eventually come out at 24 and 56. He considered a good deal of the trouble resulted from not paying sufficient attention to the bedding. Personally he found that they had always to make their own spring balance if it was to be of any use. The cutting of mica was favoured, perhaps, because mica caused trouble to brushes, but on the whole it was found that it paid to cut the mica. He would like more information about the partial vacuum existing under the brushes. He considered that small, narrow brushes were the best for engine-driven dynamos. For turbo dynamos one must have a box-type brush, and for radial commutators they required something with a good spring.

MR. T. CARTER (Newcastle-upon-Tyne) said it was necessary for the manufacturer to be as expert as possible about the brushes he put on his machine. The matter of brush grades was often very casually treated even by those who should know better. All that mattered to a manufacturer was to get a brush that suited the great majority of his machines, irrespective of its cost; the best brush might occasionally be the worst, that was the cheapest, from the brush-maker's point of view. Standardisation was a complicated matter as regarded carbon brushes. The author took an essentially sane view, and pointed out the insuperable difficulty of standardising quality. Size was comparatively a simple matter, but to standardise size without quality would land the inexperienced user in greater difficulties than at present. Each maker's standard machine, having its own peculiarities, should be fitted with brushes of a grade selected by the maker. If dealers were going to stock standardised brushes they would keep one or two grades only which would be sold as "just as good" as those the user wished to replace, and disastrous results would probably follow. The very fact that each maker had his own shape and size of brush in the same way as he had his own shape and size of bearings compelled the user to go to the maker for spares, with the result that the user got the right articles every time. The Admiralty had standardised sizes of brushes, and also mentioned a grade as a sort of reference. This had been done with successful results, but it was due rather to the easy conditions specified as regarded density and other factors than to any special merit in the standardisation. By all means let standardisation be achieved if possible, but let it be thrashed out to the last detail by those who were experts in the technical side of the subject, and adopted, if at all, only after the broadest possible view of the whole subject had been taken. He considered it was possible for each manufacturer of a standard line of machines to find, at most, two grades and perhaps one grade only, which would suit, say, 80 per cent. or 85 per cent. of his machines. There could, therefore, be a more or less universal brush for each maker's requirements, but it was not reasonable to expect a universal brush for all designs. The matter of contact drop was an exceedingly important one; he knew of a case where increased pressure on brushes actually reduced the commutator temperature because the contact drop was so much smaller that the total commutator losses were reduced in spite of the increased friction loss. There was, he believed, a very considerable difference between the positive and negative contact drops; which was the larger of the two? and by how much did the two drops differ from each other? Recently he had come across a dynamo with graphite brushes where the negative brushes heated very considerably more than those on the other pole. The matter was complicated by the swelling of the graphite brushes—a feature not to be lost sight of in designing brush holders—which caused them to stick one by one in the boxes, and so overloaded those which remained free until all were more or less stuck.

Curiously enough, the negative brushes which, on the quasi-electrolytic theory, should have worn more than the others actually wore very much less, and there were other altogether unusual features. Years ago he had come across a case, which was never satisfactorily explained, where a graphite brush was tried to improve commutation on a dynamo, but could not be adopted because it converted a previously normal machine into one hopelessly under-compounded, almost as though the brush deposited a semi-insulating skin on the commutator. He (Mr. Carter) was inclined to think that the brush holders should be set even less than ¼ in. away from the commutator; they should be just far enough away to get in the emery or carborundum cloth for bedding the brushes, which would mean about 0.05 in. only. The importance of the insulated brush top in cases where there was vibration could not be over-estimated, as it prevented the pressure finger digging into the brush. In fact, if the whole of the brush box could be insulated from the brush in such circumstances much of the difficulty would probably disappear. Loose brushes implied chattering, which, sooner or later, led to a mechanical break up of the brush with disintegration of the flexible connection, and other disagreeable results. What was the maximum voltage of a machine using a copper graphite, mostly copper, brush? He had found difficulty even with interpoles in a plating dynamo giving 15 volts, but was inclined to put the limit at about 10 volts. He preferred not to groove mica, but to use a brush sufficiently abrasive to keep it down. If mica tended to come up in a new machine persistent scouring with fine carborundum cloth—emery was no good for the purpose—for two or three weeks would often entirely save the trouble, and only if it persisted, in spite of everything, was it necessary to try different brushes or, as a last resort, to groove the mica. In any case the grooving, if well and cleanly done, need not be more than 1/32 in. deep, as the prevention of wear it ensured would mean that the copper would disappear only very slowly, and the mica need not be regrooved for a long time. On no account must lubricant ever be used on a commutator; if brushes were noisy they should be changed for others which would run more quietly. He had occasionally found only one or two brushes picking copper on a machine, and merely cleaning the contact surface was not a cure. But if the picking was due to the commutator being new, and not having a good skin developed on it, this isolated picking could frequently be cured merely by substituting a new brush for the one which had been giving trouble. It would almost appear as if the copper particles were carried some small distance into the brush, thus altering it for a little of its length behind the contact surface, so that cleaning still left a surface of too low a resistance, which tended to produce abnormal current density in that same brush again, so causing picking to continue; whereas if a new brush were put in, and the commutator had begun to get a new skin on it, the tendency to start picking would have disappeared.

MR. BROWN (Bradford) remarked that he had over 250 types of brushes to tackle, and at times the thing was really unwieldy. Brush-holders were wrapped up with the question of brushes themselves. He wondered whether something could not be done to bring out a standard holder which could be adapted to a good many machines at least, but he was afraid that state of affairs would not come about until those who built motors and dynamos gave up building and making them, and started manufacturing. With regard to brushes, brush holders and commutators generally, a great deal could be done to simplify matters and to make the motor and dynamo much cheaper than they were at present. When he talked to his assistants about brush troubles they suggested that an effective way out of the difficulty was to scrap all the D.C. machines and put in A.C. There was common sense in that. He thought that tests must be made on the machine itself by the user. Although a machine might run well on a six- or eight-hours' test at the makers' works, the full results were not seen until the machine had been in the user's works, and had been in service for some time. It seemed to him that some concerted effort ought to be made by the users or manufacturers, or both of them, to try to find out whether some of the difficulties which did arise could not be cleared away by some effort between the two by giving the machines a long test, or something of that nature. He wondered whether three qualities of any good type of brush could not be made; soft, medium, and hard. Many mixtures were made up to suit one or two particular machines—that might have to be done in order to secure effective running—but that suggested something wrong with the design of the machine. With regard to the author's statement that "If a small proportion of copper is added, the effect is actually to increase the resistance," he (the speaker) would like to know why that was so. He had been told that by adding a small amount of copper to a brush the resistance was sensibly decreased. Apparently the author's opinion was that it was not quite so. The question of mica was, as the author truly said, a most important matter. In the majority of cases he had found that if the machine did not run well, grooving the mica assisted it considerably, and in some cases entirely overcame all difficulties. He remembered a case where three fairly large-sized machines would not run beyond a few weeks at a time without the commutator being skimmed up. It did not matter what sort of brush was used, it was an absolute impossibility to make the machine run well. The makers spent many months over the problem, but had to give it up. As a last resort the mica was grooved, and no more trouble had been experienced with the machine. Cutting the mica was becoming a common practice. It was a good thing to do if one was getting trouble with hard mica. He would like to put in a plea for some real effort to be made, particularly in the smaller sizes of machines, to see whether it was not possible out of all the multiplicity of types of holders in the country to get down to half a dozen patterns. He did not know two makers who both used the same kind of holder. He was certain that if something could be done on those lines, if it did not cheapen the machine itself, it would make for satisfactory work.

MR. SHAW desired to put in a plea for standardisation. They should standardise the sizes, the pigtails, and the tops, even if the qualities followed later on. The space devoted to brushes in his stores was simply amazing. On all the large machines he had anything to do with they found it essential to cut the mica; the running was more satisfactory. They had had a lot of trouble with slip rings on 1,500-KW. rotors. One grade of brush caused trouble, and the next brush seemed to tear the slip ring; there seemed no mean between the two.

MR. WALKER observed that there was plenty of scope to improve the proper use of brushes. The box-type brush-holder was the best to use for industrial motors. He endorsed the expression with regard to the standardisation of brushes; personally he thought they ought to be standardised with regard to section and length. His employers had 1,500 motors on hire, and it could be imagined the trouble they had in sending out to faults, which were very numerous so far as brushes were concerned. He believed there were 300 types of brushes. Whenever a brush fault occurred it meant a double journey for the motor inspector. He considered it was essential to standardise to one, two, or three types of brushes in sizes only.

MR. HUNTER-BROWN, replying to the discussion, said that sparkless running, in the true sense of the term, probably was not sparkless running; he called it sparkless when one could not see the sparks, though in reality he did not think it ever was sparkless. He thought that the passage of current from a fixed box to a revolving commutator or slip ring necessarily meant that there were minute arcs underneath the brush. That accounted for the peculiar shape of the contact-drop curve, and for the fact—at all events he maintained it was a fact—that there was a minimum voltage below which no current would flow. With regard to cutting mica, it was not a fair demand to put on a brush, which had to run on a commutator running at a speed of 9,000 ft. per min., the duty of grinding down the mica, especially when the mica was an unknown quantity. He did not advocate recessing the mica in some cases; in some cases it was difficult. At speeds, say, of 4,000 ft. per minute he considered there was a great deal to be said for recessing, and in many cases it was essential. If it was done an abrasive type of brush might be used, and that meant a longer life for the commutator and for the brush, and he thought the method of trying the machine first of all with mica flush was good; it was impossible to predict with certainty whether it would be ultimately necessary to recess the mica on a particular machine or not. With regard to the curious phenomena of suction, the definite fact was that when the friction was reduced the coefficiency was greatly increased. His theory was that it was due to atmospheric pressure on the top of the brush. He agreed with Mr. Carter that price was not an indication of suitability or quality. People sometimes advocated very strongly the using of the best quality of brushes. What was generally meant by that was a high-grade brush with a high price; that did not mean it was the best brush to give the best results on any given machine. Suitability must be determined from quite a different point of view. Mr. Carter remarked that they had succeeded in using a single quality of brush for about 85 per cent. of their machines. That was a very interesting fact, but the curious thing was that he (Mr. Brown) could mention several other firms in the country who had succeeded in doing the same, but in every instance each firm had its own particular quality of brush. No two firms' brushes were the same quality; that was an illustration of how subtle the differences in brush qualities were. As to the difference between the drop at the positive and negative brush that was a point which he had very carefully avoided touching upon in the paper. The reason was that he did not find any consistent behaviour in some types. With regard to copper-graphite brushes, and brushes made of graphite, the drop at the positive brush, speaking in a motor sense, was greater than the negative. That was particularly so in copper-graphitic brushes, the drop was very much greater in that instance. With carbon brushes it varied very much indeed, often the negative was greater than the positive. A completely insulated holder would get over certain difficulties, but it would introduce a greater one, that is such a holder, or rather the brush inside such a holder, would be thermally insulated as well as electrically insulated. Unless the heat was got away a destructive temperature rise was bound to occur. With regard to circulating currents, he thought they were troubled much more by local circulating currents than they were by circulating currents between spindles. He did not quite know how some would define a highly-marked brush, but assuming

the brush to consist of 75 per cent. of copper, he would not expect to be able to use it on a machine above about 10 volts. As regarded copper picking, he fully confirmed the remarks made to the effect that once a brush acquired the habit of copper picking it would do it for ever, or, at all events, until a lot was cut off from the contact surface, perhaps half an inch. He thought it was probable that the brush, when picking copper, carried high currents, at least local, and that those spots in the brush were graphitised, which, due to their low resistance, took an undue share of the load even after the copper had been thinned off. A B.E.A.M.A. Committee was sitting on the standardisation of holders question. Naturally there was a good deal of diversity of opinion, but he thought that definite steps would be taken in the direction of standardising a holder, both as to design and the size of the brush it should carry. There would probably be a couple of widths and at least three or four thicknesses of brush in each width. As to why a small addition of copper increased the resistance of a brush, he imagined that the reason was that if no copper was used the whole of the graphite or carbon, or combination of various substances used, would become well bonded together in a homogeneous mass, and they got complete continuity in the direction from end to end of the brush, but if a small quantity of copper was put in the particles seemed to have the effect of breaking up that continuity, making a series of little contact resistances throughout the length of the brush. If the process was continued, and the quantity of copper increased, a point was reached where the benefit of the conductivity of the metal put in was felt, and the conductivity of the brush went up.

THE NAVIGATIONAL MAGNETIC COMPASS CONSIDERED AS AN INSTRUMENT OF PRECISION.*

BY M. B. FIELD, O.B.E., M.INST.C.E., M.I.E.E.

(*Continued from page* 67.)

In view of the difficulties experienced in the adjustment of the standard compass of the "Great Eastern," the errors which arise from the length and arrangement of the needles were carefully studied experimentally by Commander Evans, and mathematically by Archibald Smith, the results of the investigation being given in a combined paper in the *Philosophical Transactions*, 1861. By this investigation, the authors arrived at a remarkable result, namely, that by a certain arrangement of needles on a compass card, in place of a single needle, the errors due to length-of-needle very nearly disappeared, and that the particular arrangement necessary for the fulfilment of this condition was the very one which had been adopted in the construction of the standard Admiralty compass, entirely on account of other considerations.

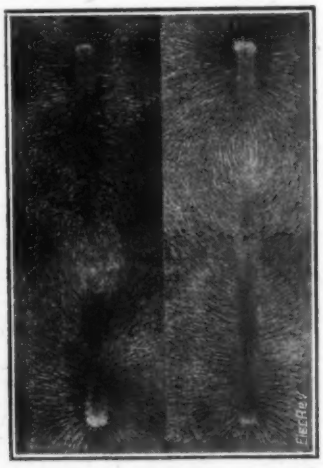


FIG. 6A.—CHANGE IN DISTRIBUTION OF MAGNETISM WITH TIME.

The standard Admiralty compass card at that date was provided with four needles arranged as in fig. 7. The object of this particular arrangement was to ensure that the moment of inertia of the system about all diameters was the same, a condition favourable to the elimination of what was termed "wobbly" motion of the card.

The coincidence discovered mathematically and demonstrated experimentally by Smith and Evans was that if the poles of the needles in the two-needle card subtend 60 deg., or in the four-needle card are placed at equal distances measured circumferentially from the extremities of the 60 deg. chords, as, for example, in fig. 7, the magnetic errors due to length-of-needle largely disappear.

For the purpose of producing steadiness, one naturally inclines to some method of fluid friction damping, but for definite practical considerations, to be later discussed, Lord Kelvin dismissed the idea of fluid damping. He rather sought to render the card inherently stable under ordinary seagoing conditions.

The other intensely practical considerations from the mariner's point of view were, as usual, prominently before Lord Kelvin. The card must stand rough handling, it should be capable of deformation and yielding to stresses and of recovery without damage. It must stand the weather of all

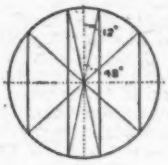


FIG. 7.—STANDARD ADMIRALTY COMPASS CARD.

climates, intense heat and cold, prolonged dryness and humidity without warping, while the pivot, jewel, or even the card itself, must be capable of replacement at a moment's notice, in case of emergency, by spares usually provided with the outfit; and this must be possible without liability of damage by a not very delicate-handed navigator under unfavourable conditions at sea.

I cannot do better than to repeat here Lord Kelvin's own words:—

"The problem of obtaining a compass which shall be steadier at sea, and shall also be better adapted for the perfect correction of the error due to the iron of an iron ship, or of cargo carried by the ship, requires:—

"1. For steadiness, a very long vibrational period with small frictional error.

"2. Short enough needles to allow the correction to be accurate on all courses of the ship for the place where the adjustment is made.

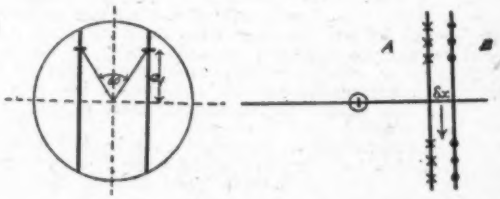
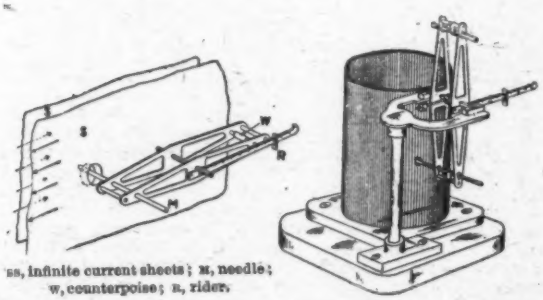


FIG. 7A. FIG. 7B.

"3. Small enough magnetic moment of the needles to allow the correction of the quadrantal error to remain accurate to whatever part of the world the ship may go."

Lord Kelvin then proceeds to describe his well-known compass card and compass. Speaking of the card, he states that the weight of his design was one-seventeenth part of the weight of the ordinary 10-inch card hitherto in common



ss, infinite current sheets; M, needle; W, counterpoise; R, rider.

FIG. 8.—DIAGRAM OF MAGNETIC DISTRIBUTION TESTER. FIG. 9.—PRACTICAL FORM OF DISTRIBUTION TESTER.

use in the best-found merchant steamers, which was about 6 ounces. Further, that the magnetic moment was only about one-thirteenth part of that of the two needles of the ordinary ten-inch card as made at that date, and was so small that the error due to its inductive influence on the iron globes used for correcting the quadrantal error was practically insensible.

As an alternative to the "dry" compass just described, we have the liquid or spirit-filled compass. The liquid type

*Abstract of lecture delivered before the INSTITUTION OF ELECTRICAL ENGINEERS, London, January 9th, 1919.

is undoubtedly favoured by some navigators, on account of its extreme deadbeatness, especially for steering purposes. In small, light craft, it becomes a necessity in rough weather, and whenever space restrictions do not permit of the use of a 10-in. dry card, the spirit compass should be resorted to.

This type, however, is by no means perfect, and suffers from the disadvantage that it is very much overdamped, necessitating an undesirably great magnetic moment, and, consequently, a great mass in the moving system.

Some idea of the strength of needles and the great masses employed in the cards of liquid compasses may be formed by a perusal of the following table, comparing a 10-in. Kelvin card (dry) with various makes of card for liquid compasses.

COMPARISON OF STANDARD 10" DRY AND SOME LIQUID CARDS.

	Diameter of card.	Max. length of needle.	Weight in air. Grammes	Mom'nt of inertia. C.G.S.	Magnetic moment. C.G.S.	Time of half period at Glasgow. Seconds.	
Standard 10" "dry" card	10"	3⅛"	13	1,200	300	16 (in air)	
Naval liquid compass	6½"	3½"	82	1,060	1,600	16	Liquid: 50 % alcohol, 50 % water at 30° C.
U.S.A. Naval ditto (Ritchie)	7⅛"	4⅛"	100	2,910	2,400	21	
Ritchie	9"	7¼"	152	3,270	5,160	29·5	
Common steering compass	9"	7"	135	5,110	2,300	30	

In the case of the liquid compass the card is deviated 45° and released; the time interval between the 1st and 2nd transit of N-point of card past the lubber line is the half period.

In order to reduce the requisite magnetic moment, one naturally considers how to reduce the moment of inertia of the card. But when the moment of inertia has been reduced to the furthest possible limit, the *magnetic* moment must still be considerable, if we are to have a moderately quick-acting card. The reason is that the effective moment of inertia does not reside solely in the card, but partly in the fluid. As the card oscillates, the liquid in the immediate vicinity of the card is dragged backwards and forwards with it, and this has the effect of apparently augmenting the moment of inertia of the card itself.

Thus, when we have reduced the moment of inertia of the solid moving system to the furthest possible limit, we may

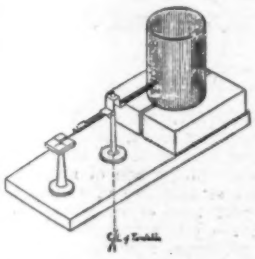
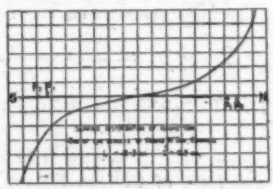


FIG. 10.—MAGNETIC BALANCE FOR TESTING DISTRIBUTION.



One of the Needles of a Kelvin Dry Compass; length 8·3 cm.; diameter 0·123 cm.

FIG. 11.—SURFACE DISTRIBUTION OF MAGNETISM.

find the effect of the liquid dragged by it is equivalent to a moment of inertia several times as great as that of the card itself.

We have, in fact, a total effect of:—

First, loading the card with an additional moment of inertia;

Secondly, retarding it by a damping torque at every instant proportional to the velocity.

Both of these effects are proportional to a quantity $\sqrt{\mu \rho}$, where μ is the coefficient of viscosity and ρ is the density of the liquid. If we can materially reduce this quantity, we shall materially improve the behaviour of the compass. In my opinion, a real improvement is to be looked for in the spirit compass by finding a more suitable substitute for the liquid now commonly employed.

In elaborating his theory, Smith assumed that the magnetism might be considered as concentrated at points near the ends of the needles; while this is legitimate when we are considering the couple exerted on the needle in a uniform field, it is not strictly legitimate when we are dealing with non-uniform fields.

Let us assume that the needle is symmetrically magnetised about its centre O, and that we have an amount of magnetic matter $(\sigma\, \delta x)$ on an element situated at a distance x from O; then

$$\sqrt{\Sigma x^3 (\sigma\, \delta x)/M} = a_1$$

where M is the magnetic moment of the needle and a_1 is a certain length.

We measure a_1 off from the centre of each needle, and so dispose them that the points thus found subtend an angle of 60 deg. at the card centre (fig. 7A).

This is the necessary modification of the Arch. Smith theory when we take into account distributed magnetism on the needles.

It now remains for us to see how we determine the amount of magnetic matter on each element of the needle.

Imagine that the element x is bounded by two transverse planes, and that we can in some way create a uniform field of unit intensity vertically downwards between these planes. The magnetic matter on the element in question will then experience a force vertically downwards equal to $(\sigma\, \delta x)$ dynes. If we weigh the force in dynes, the reading of the balance will be the quantity of magnetic matter in C.G.S. units.

Next consider the transverse boundary planes are infinite current sheets with current flowing away from us in the left-hand plane, and towards us in the right-hand plane, as shown by the crosses and dots (fig. 7B); suppose that the current in the current sheets is uniform and has a density of $10/4\pi$ amps. per cm.; we shall have no magnetic field in the space A to the left of the current sheets, no force in the space B to the right of the sheets, and a uniform field of unit intensity

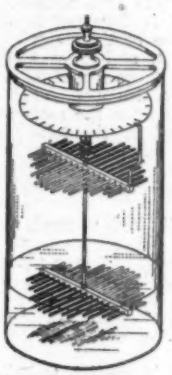


FIG. 12.—TORSION DYNAMOMETER FOR MAGNETIC MOMENT.

FIG. 13.—TORSION DYNAMOMETER IN USE.

directed vertically downwards in the space between the sheets. We may thus picture to ourselves a magnetic balance for weighing the amount of magnetic matter on each element of the needle. Such a balance is represented conventionally in fig. 8. In a practical apparatus, however, we have to get round the difficulty of using infinite current sheets.

Fig. 9 shows a further development of the balance by which we arrive at the desired result. Here we have two cylindric current sheets of convenient dimensions as a substitute for our infinite plane sheets.

These cylindrical sheets are obtained by taking a piece of brass tube as a former, and overwinding by a layer of fine wire uniformly spaced, so that current flows uniformly down the outside surface of the cylinder, and uniformly up the inside surface.

If the distance between the cylindrical current sheets be small compared with their radii, we have:—

No field inside the inner cylinder,
No field outside the outer cylinder,

and practically a uniform field in the annular space between the current sheets, the lines of force being circles concentric with the cylinder, and lying in transverse planes.

A small hole is drilled through the sheets through which the needle under test passes. The magnetic matter situated in the annular space between the sheets is urged laterally by the magnetic force existing there, and the force is weighed by the small adjustable weight on the balance arm.

Another form of apparatus which I have found convenient for the purpose is shown in fig. 10. In this, the force on the element is balanced against the earth's directive force on the whole needle. The complete stand is mounted on a graduated turntable, and rotated in azimuth until balance is obtained.

If H = earth's horizontal force,
M = magnetic moment of the needle,
θ = angle measured from the meridian at which balance is obtained,
F = known magnetic force in the annular space,
l = distance from pivot to mid point between current sheets, we have

$$H M \sin\theta = F l (\sigma\, \delta x),$$

hence the amount of magnetic matter on the element δx.

Fig. 11 shows the character of the distribution obtained in the case of some needles used in compass construction.

In making use of the arrangements described, we must satisfy ourselves that the effect of the bulging of the magnetic field out of the small hole through which we pass the needle does not produce a large error. But if the apparatus be properly designed, we can get accurate measurements up to about 5 mm. from the end of these needles.

Having determined the magnetic distribution, we have all the necessary information to enable us to determine the length a_1, and hence correctly to dispose the needles in the card.

Figs. 12 and 13 show a very convenient apparatus for measuring quickly the magnetic moments of cards without removing them from their containing bowls. It consists of a glass jar inside which a needle, arranged to be astatic in the earth's field, is suspended from a torsion head. Each element of the needle has a strength of about 600 C.G.S. units, the elements being separated by about 10 cm. The lower one swings clear of the bottom of the jar, and is immersed in damping fluid. The spindle is supported on a fibre and controlled by a torsion spring, the ends of which are attached to the spindle and the torsion head respectively. The spindle carries a pointer which moves over a graduated dial, attached to, and moving with, the torsion head, but arranged to be independently rotatable, so that it can be set to zero when the tension of the control spring is zero.

The jar is placed centrally on the compass bowl glass, and in this position the lower element of the astatic combination comes within range of the sensible force of the card needles. The torsion head is rotated until the card is deflected into the E.-W. position. We then know that the earth is acting upon the card with a torque equal to H M, and since the astatic needle is co-axial with the card, the torques mutually exerted between card and astatic system are also H M. This, however, is the only magnetic couple acting upon the astatic system, and it must, therefore, be balanced by the torsion of the control spring. Since the one end of the spring is virtually attached to the dial, and the other to the pointer, the position of the pointer on the dial represents the amount of torsion of the spring.

The torsion head may, therefore, be calibrated to read M direct for any place where H is known, it being understood that M is indicated on the dial when the torsion is such that the card under test is deflected into the E.-W. meridian.

Where a very powerful card is under test, it may be deflected by only 30 deg., in which case the readings of the torsion head must be doubled. It will be observed the accuracy of the device depends upon :—

1. The astaticism of the system, which is readily tested and adjusted from time to time; and

2. The calibration of the control spring. It in no way depends upon the strength of the needles of the astatic system, or upon their distance from the card.

For the purpose of measuring moments of small magnets, the apparatus is completed by the addition of a special dry bowl and card (without magnets) provided with a cradle upon which any small magnet may be placed.

Having measured the magnetic moment, the moment of inertia is most easily determined by calculation from the period of vibration.

(To be concluded.)

NEW PATENTS APPLIED FOR, 1918.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. SEPTON-JONES, O'DELL AND STEPHENS (successors to W. P. Thompson & Co., of London), Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

299. "Joint box for connecting armoured electric cables." J. HOGGAN. January 6th.

317/8. "Sparking plugs for internal-combustion engines." J. E. BARROWS. January 6th.

336. "Electric lampholder with insulator contacts and lamp-locking device." F. S. SARGEANT. January 6th.

352. "X-ray apparatus for dental use." W. H. THWAITES. January 6th.

355. "Primary batteries." H. S. HATFIELD. January 6th.

357. "Primary cell." H. S. HATFIELD. January 6th.

361. "Electric starters for internal-combustion engines." A. H. MIDGLEY AND C. A. VANDERVELL & Co. January 6th.

362. "Deflection of electric arcs." L. LOMBARDI. January 6th.

364. "Electric furnaces." ARMOUR FERTILIZER WORKS. January 6th. (U.S.A., January 28th, 1918.)

370. "Protective devices for alternating-current electric distribution systems." BRITISH THOMSON-HOUSTON Co. & E. B. WEDMORE. January 6th.

378. "Electric switches." R. K. DAMEY. January 6th.

390. "Manufacture of carbon-electric conductors." Soc. ELECTRO-METALLURGIQUE FRANÇAISE. January 6th. (France, January 26th, 1918.)

407. "Apparatus for recording reaction times by means of electrically-controlled signals and chronoscope." L. E. STAMM. January 7th.

454. "Ignition devices for internal-combustion engines." T. MOORE. January 7th.

466. "Electric batteries." COMMERCIAL TRUCK Co. January 7th.

496. "Sparking plugs for internal-combustion engines." L. MACQUAIRE. January 7th.

510. "Terminal connections for electric accumulators, batteries, sparking plugs, &c." C. C. BRYAN. January 8th.

511. "Sparking plus." C. C. BRYAN. January 8th.

512. "Electric lamps for motor vehicles, &c." G. A. EDMAN. January 8th.

517. "Portable electric lighter for pipes, cigars, &c." J. E. L. WRIGHT-ASHWORTH. January 8th.

524. "Electricity meters." G. WATSON. January 8th.

537. "Synchronous electric motors." G. C. MARTIN. January 8th.

558. "Fuse for high and low-tension electrical circuits." G. B. FAWCETT. January 8th.

581. "Sparking plugs." Soc. INDUSTRIELLE DE DELLE. January 8th. (France, March 2nd, 1918.)

615. "Controlling dynamo-electric machines running at varying speeds." H. F. FOSTER & A. W. S. POCKLINGTON. January 9th.

622. "Obtaining single-phase alternating electric currents from three-phase or *vice versa*." A. M. TAYLOR. January 9th.

638. "Electrically-operated valve for control of steam, gas, air, liquids, &c." G. WILKINSON. January 9th.

642. "Magneto motor acting by repulsive movements between double poles." D. SUCHOSTAWER. January 9th.

644. "Equaliser connections on armatures of electrical machines." E. BOLTON. January 9th.

668. "Electric batteries." G. N. ANTONOFF. January 9th.

683. "Electrically-heated melting furnaces." L. C. HARVEY. January 9th.

694. "Telephone circuits." B. S. COHEN. January 9th.

721. "Apparatus for electro-deposition of iron." S. O. COWPER-COLES. January 10th.

722. "Means for coating articles with zinc." S. O. COWPER-COLES. January 10th.

723. "Manufacture of iron tubes by electro-deposition." S. O. COWPER-COLES. January 10th.

730. "Electric lampholders." H. BEY. January 10th.

765. "Electric contacts." S. G. BROWN. January 10th.

806. "Electrical earthing devices." R. S. WOODS. January 11th.

827. "Magnetos." H. DE LA VALETTE. January 11th. (France, February 27th, 1918.)

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1916.

13,251. TELEGRAPHIC RELAYS. J. S. Withers (K. C. Cox). September 18th, 1916. (121,489.)

1917.

894. CONSTRUCTION OF ELECTRIC GENERATORS AND MOTORS FOR WORKING UNDER WATER OR OTHER LIQUID. J. S. Highfield. January 18th, 1917. (121,490.)

13,746. IGNITION DEVICES FOR INTERNAL-COMBUSTION ENGINES. W. G. Ikin. September 24th, 1917. (Cognate application 5,191/18.) (121,493.)

14,664. ELECTRICALLY-HEATED CLOTHING SUITABLE FOR AVIATORS, THE DRIVERS OF AND PASSENGERS IN AUTOMOBILES, AND OTHERS. A. A. Lemercier. October 10th, 1917. (121,495.)

16,717. METHODS OF AND APPARATUS FOR TRANSFORMING THE FREQUENCY OF ELECTRIC CURRENTS. British Thomson-Houston Co. (General Electric Co., U.S.A.) November 14th, 1917. (121,500.)

1918.

210. WIRE-ATTACHING DEVICE FOR THE SPARKING PLUGS OF EXPLOSION MOTORS. A. Jouveau & C. Tournoud. August 11th, 1916. (112,463.)

3,105. METHODS OF MANUFACTURING CYLINDRICAL MAGNET FRAMES AND THE LIKE. British Thomson-Houston Co. (General Electric Co., U.S.A.) February 21st, 1918. (121,547.)

6,563. ELECTRIC FURNACES. T. H. Watson & Co., H. A. Greaves & H. Etchells. April 18th, 1918. (Addition to 106,626.) (121,563.)

7,581. OVERHEAD TIME-LIMIT RELAYS FOR ELECTRIC CIRCUITS. British Westinghouse Electric & Manufacturing Co. May 7th, 1917. (116,276.)

The War and the Nitrogen Industry.—In a paper read before the American Electrochemical Society, Mr. W. S. Landis states that, according to the best available statistics, ten years ago, or in 1908, the world's production of nitrogen in the form of Chilean nitrate and of sulphate of ammonia was equivalent to only 503,000 short tons of nitrogen. In 1914, at the outbreak of the war, the producing rate of the world in short tons of chemical nitrogen, according to the best available statistics, is given in the following table :—

	Nitrogen, short tons.
Nitrate of soda	425,000
Sulphate of ammonia	285,000
Arc process products	11,000
Cyanamide products	31,000
Synthetic ammonia and miscellaneous ...	12,000
Total—short tons nitrogen	764,000

In 1919 the producing capacity of the world, including the United States Government nitrate plants now under construction, is estimated to be as follows :—

	Nitrogen, short tons
Nitrate of soda	520,000
Sulphate of ammonia	330,000
Arc process products	15,000
Cyanamide products	360,000
Synthetic ammonia and miscellaneous ...	116,000
Total—short tons nitrogen	1,341,000

As relates to the world as a whole there has not been the great over-expansion of producing capacity that most people believed. The available nitrogen supply expanded under the influence of war only to the point any one would have predicted in the spring of 1914 from a study of its past statistics. Undoubtedly the demand will drop off somewhat with the advent of peace, but with the anticipated high food prices continuing for some time afterward, this drop in nitrogen consumption should not be excessive. On the other hand, many plants erected under the wartime emergency are so located geographically and economically that operation after the emergency is past will be impossible. We may, therefore, expect a material reduction in producing capacity. That the decrease in demand and in production will be somewhat of the same order is at least a plausible assumption.